Federal State Autonomous Educational Institution
of Higher Education
«Peoples ' Friendship University of Russia»

Engineering Academy

WORKING PROGRAM OF THE DISCIPLINE

Name of the discipline: Current development of production of unconventional hydrocarbon in the world

Training area: 21.04.01 Oil and gas engineering

Program (focus (profile)): Oil and gas production and transportation technologies

1. Purpose and objectives of the discipline

The purpose of mastering the discipline "Current development of production of unconventional hydrocarbon in the world" is aimed at students' acquisition of theoretical knowledge, practical skills, as well as their development of innovative technologies for quarry, mine and well development of unconventional hydrocarbons.

The main **objectives** of the discipline are:

- understanding of the concept of "unconventional source of hydrocarbons", the economic benefits of their use;
- mastering students ' knowledge about the characteristics and features of non-traditional sources of hydrocarbons, modern methods of their use, problems and prospects for the development of the industry of exploitation of non-traditional sources of hydrocarbons, mastering methods for evaluating their effectiveness.

2. Place of the discipline in the structure of the educational program

Discipline "Current development of production of unconventional hydrocarbon in the world" refers to the elective component of the part, formed by participants of educational relations in Block 1 of the curriculum. Its study is based on the material of previous disciplines, and it is also basic for studying subsequent disciplines of the curriculum, the list of which is presented in Table 1.

Table 1-List of previous and subsequent disciplines

n/a number	Previous disciplines	Subsequent disciplines
1	History and methodology of subsurface use	Technological practice (training program)
2	Reservoir pressure maintenance systems using multi-stage vane pumps	Technological practice (production)
3	Dual completion of well for production	Pre-graduate practice
4	Information technologies in the oil and gas industry	State final certification
5	Technology and technique of water and gas impact on the formation	

3. List of planned results of training in the discipline, correlated with the planned results of mastering the educational program

The result of training in the discipline is knowledge, skills, abilities and (or) experience of activity that characterize the stages of competence formation and ensure the achievement of the planned results of mastering the educational program, presented in table 2.

Table 2-Results of training in the discipline, correlated with the planned results of mastering the OPOP in higher education

Competence	of Knowledge	Skills	Skills
1	2	3	4

PC-1Able to plan and conduct analytical, simulation and experimental studies, to critically evaluate data and draw conclusions	methods of analysis of information on the technological process and the work of technical devices in the oil and gas industry	to plan and conduct necessary experiments, and process, including application software, to interpret the results and draw appropriate conclusions; to conduct certification of technical means, systems, processes, equipment and materials	inladee the ability to use physical and mathematical apparatus for solving analytical problems that arise in the course of professional activity

4. Scope of the discipline and types of academic work

Table 3-Scope of the discipline and types of academic work
for full-time and part-time education

Type of academic work		Total, acc. hours	Module
			6
Classroom activities		32	32
including:			
Lectures (L)		8	8
Practical exercises (Pr)		24	24
Laboratory work (LR)		-	-
Independent work (SRS), including control		112	112
Type of certification test			The exam
Total labor	144	144	144
	144	4	4

5. Content of the discipline

Table 4-Content of the discipline and types of classes
for full-time and part-time education

n/a number	Name of the section of the discipline / topic of the lesson	Lecture hall .	Pract. / workshop.	Lab.	SRS	Just an hour.
	6 Module					
1.	**Section #1. General information on unconventional hydrocarbon deposits**	**2**	**6**		**18**	**26**
	Topic 1.1. Geological and physical features of unconventional hydrocarbon deposits	2	6		18	26
2.	**Section No.2. Quarry method of field development**	**2**	**6**		**20**	**28**
	Topic 2.1. General information about open pit mining operations	1	3		10	14
	Topic 2.2. Opening of deposits	1	3		10	14
3.	**Section #3. Mine method of field development**	**2**	**6**		**20**	**28**
	Topic 3.1. Ukhta method	1	3		10	14
	Topic 3.2. Downhole method	1	3		10	14

n/a number	Name of the section of the discipline / topic of the lesson	Lecture hall .	Pract. / workshop.	Lab.	SRS	Just an hour.
4.	**Section #4. Borehole method of field development**	**2**	**6**		**18**	**26**
	Topic 4.1. Downhole hydraulic extraction of raw	2	6		18	26
	Exam					**36**

6. Educational technologies

Organization of classes in the discipline "Current development of production of unconventional hydrocarbon in the world" is conducted according to the following types of educational work: lectures, practical exercises.

The implementation of the competence approach in the framework of the training area 21.04.01 Oil and gas engineering provides for a combination of contact work with the teacher and extracurricular independent work of students in the educational process for a more complete formation and development of their professional skills.

Lectures are held in a live audience, including using a multimedia projector in the form of an educational presentation. The main points of the lecture sessions are outlined by students, individual topics (parts of topics and sections) are offered for self-study with the obligatory compilation of a summary (checked by the teacher during the current control).

The purpose of practical classes and laboratory work is for students to gain knowledge and develop practical skills in solving complex issues related to innovative technologies for quarry, mine and well development of unconventional hydrocarbons. To achieve these goals, both traditional forms of work are used – problem solving, working with technological equipment/specialized software when performing laboratory work, etc., and interactive methods – group work, analysis of specific situations, business game, etc.

Group work when analyzing a specific situation, as well as when performing laboratory work in a subgroup, develops the ability to analyze and diagnose problems. Using the method of analyzing a specific situation, students develop such qualification qualities as the ability to clearly formulate and express their position, the ability to communicate, discuss, perceive and evaluate information received in verbal form. Practical classes and laboratory work are conducted in special classrooms equipped with the necessary visual materials.

Independent work involves students working out individual questions of the theoretical course and completing a course project.

Independent work is carried out in an individual format based on the teaching materials of the discipline (*appendices2-5*). The level of mastering the material on independently studied questions of the course is checked during the current control and certification tests (exam and/or credit).) by discipline.

7. Educational, methodological and informational support of the discipline

Basic literature:

1. Golik V. I. Special methods of field development: A textbook / - Moscow: SIC INFRA-M, 2014.

http://znanium.com/catalog/product/344986

2. Tetelmin V. V., Yazev V. A. Energy of oil and gas: A textbook /. Dolgoprudny: Intellekt Publ., 2009, 352 p. (in Russian)
http://znanium.com/catalog/product/241178
3. Tetelmin V. V., Yazev V. A., Solovyanov A. A. Shale hydrocarbons. Mining technologies. Environmental threats: A Textbook /. Dolgoprudny: Intellekt Publ., 2014, 296 p. (in Russian)
http://znanium.com/catalog/product/495846

Additional literature:

1. Apasov, T. K. Apasov T. K., Apasov R. T., Apasov G. T. Metody intensifikatsii dobycha netii i povysheniya nefteotdachi dlya polozhdeniy Zapadnoy Sibiri [Methods of oil production intensification and oil recovery enhancement for Western Siberia fields]. - Electron. dan. - Tyumen: TyuMGNUPubl., 2015, 187 p. (in Russian)
https://e.lanbook.com/book/91835
2. Ganieva, T. F. Vysokovyazkieye nefti, prirodnye bitumy i bitumonosnye porody [High-viscosity oils, natural bitumen and bitumen-bearing rocks].T.F. Ganieva, V.K. Polovnyak. - Electron. dan. Kazan: KNRTU Publ., 2012
https://e.lanbook.com/book/73243

Periodicals:

1. Neftegazovaya Vertikal magazine http://ngv.ru
2. Gas Industry Magazine http://neftegas.info/gasindustry/
3. Magazines "Neftegaz.ru" http://www.neftegaz.ru

Resources of the Internet information and telecommunications network»:

1. RUDN University EBS and third-party EBS that university students have access to on the basis of concluded contracts:
-RUDN University Electronic Library System-RUDN University Electronic Library System http://lib.rudn.ru/MegaPro/Web
- EBS "University Library online" http://www.biblioclub.ru
- EBS Urite http://www.biblio-online.ru
- EBS "Student's consultant" www.studentlibrary.ru
- EBS "Lan" http://e.lanbook.com/

2. Websites of ministries, departments, services, industrial enterprises and companies whose activities are relevant for this discipline:
- Website of the Ministry of Energy of the Russian Federation https://minenergo.gov.ru
- Gazprom PJSC http://www.gazprom.ru
- PJSC LUKOIL http://www.lukoil.ru

3. Databases and search engines:
- electronic fund of legal and regulatory and technical documentation http://docs.cntd.ru/
- Yandex search engine https: / /www.yandex.ru/
- Google search engine https://www.google.ru/
- SCOPUS abstract database http://www.elsevierscience.ru/products/scopus/

Software:

1. Specialized software for conducting lectures and laboratory classes and independent work of students:

- Specialized software "TransasShelf 6000 DrillingSimulator»
- License for ARMARIS software for TESP ESP

Methodological materials for students ' independent work and study of the discipline (also available in the corresponding section of the discipline in the TUIS RUDN University).):

1. Course of lectures on the discipline Current development of unconventional hydrocarbon production in the world (*Appendix 2*).
2. Guidelines for independent work of students in the discipline Current development of unconventional hydrocarbon production in the world (*Appendix 3*).

8. Material and technical support of the discipline

Table 5-Material and technical support of the discipline

Audience with a list of material and technical support	**Location**
Classroom # 333. A set of specialized furniture; technical means: projection screen; NEC V302X multimedia projector; DEPO Neos 220	St system unit. Podolskoe Shosse, 8k. 5
Laboratory of Mining machines room No. 358. Computer with pre-installed licensed software "ARMARIS" Intel processor Soge15, 7 pcs; "Wellhead fittings" - mock-up stand; 3D LED TV on a stand with a screen diagonal of 32 inches; Mock-up controller "Electon-09 1" from SU "Electon 05-250 " in a compact design	Ul. Podolskoe Shosse, 8k. 5
Laboratory of Mining machines, room No. 362. Set of specialized furniture; Simulator-simulator of drilling "Transas SHELF 6000 Drill"; Additional place of the trainee to the simulator-simulator of drilling "Transas SHELF 6000 Drill"	Ul. Podolskoe Shosse, 8k. 5
Laboratory of Hydrodynamic processes of oil and gas production, room No. 341. Ejector; Working table of the stand, instrumentation and control valves; Tank; Stand-model of the pump-ejector system, left view; Laser diode; Liquid column; Air compressor; Gas supply system to the column; Gas meter; Pressure gauge; Photodiode; Digital oscilloscope.	Ul. Podolskoe Shosse, 8k. 5

9. Evaluation Funds Fund

Materials for assessing the level of mastering the educational material of the discipline(evaluation materials), including a list of competencies, specifying stages of their formation, description of the indicators, and criteria of assessment competencies at different stages of their formation, the description of the scales of assessment, typical assignments or other materials necessary for the evaluation of knowledge, skills, and (or) operational experience that characterize the stages' formation of competencies in the process of mastering the educational program, training materials, defining the procedure of assessment of the knowledge, skills, proficiency and (or) operational experience that characterize the stages of competence formation have been developed in full and are available to students, on the discipline page, on the website of the RUDN University (TUIS RUDN).

The program is designed in accordance with the requirements of the RUDN University OS.

Developer:

Associate Professor of the Department of Subsurface Use and Oil and Gas Affairs		V.P. Malyukov
position	signature	initials, surname

Program Manager

Professor of the Department of Subsurface Use and Oil and Gas Engineering		V.M. Kapustin
position	signature	initials, surname

Director of the Department of Subsurface Use and Oil and Gas Engineering		A.E. Kotelnikov
position	signature	initials, surname

Federal State Autonomous Educational Institution
of Higher Education
«Peoples ' Friendship University of Russia»

Engineering Academy

WORKING PROGRAM OF THE DISCIPLINE

Name of the discipline: Cyclic operation of wells equipped with ESP

Training area: 21.04.01 Oil and gas engineering

Program (focus (profile)): Oil and gas production and transportation technologies

1. Purpose and objectives of the discipline

The purpose of mastering the discipline Cyclic operation of wells equipped with ESP is for students to acquire theoretical knowledge and practical skills in solving complex issues related to the use of pumping equipment for well operation and effective field development. Training students to determine the parameters of cyclic operation of wells with ESP installations. General information about the use of electric centrifugal pumps in the operation of wells.

The main **objectives** of the discipline are:
- study of methods and calculation of the characteristics of an electric centrifugal pump during cyclic operation;
- study and development of the principles of cyclic well operation;
- acquisition of skills in choosing a particular equipment.

2. Place of the discipline in the structure of the educational program

The discipline Cyclic operation of wells equipped with ESP refers to the variable part of Block 1 of the curriculum. Its study is based on the material of previous disciplines, and it is also basic for studying subsequent disciplines of the curriculum, the list of which is presented in Table 1.

Table 1-List of previous and subsequent disciplines

n/a number	Previous disciplines	Subsequent disciplines
1	Simultaneously-separate operation of wells	Commercial Geophysics / Current development of unconventional hydrocarbon production in the world
2	Reservoir pressure maintenance systems using multi-stage vane pumps	Output of wells equipped with ESP to mode
3	Software package for assessing the reliability of submersible equipment based on operational data	Methods for improving the ESP resource
4	Universal method of selecting submersible vane pump installations for oil production	State final certification
5	Submersible vane pump installations for oil production	

3. List of planned results of training in the discipline, correlated with the planned results of mastering the educational program

The discipline Cyclic operation of wells equipped with ESP is aimed at developing the following competencies in students:

- with the ability to analyze and summarize data on the operation of technological equipment, monitor, provide technical support and manage technological processes in the oil and gas industry (PC-2);

-it is responsible for ensuring safe and efficient operation and operation of technological equipment in the oil and gasтindustry (PC-3).

The result of training in the discipline is knowledge, skills, abilities and (or) experience of activity that characterize the stages of competence formation and ensure the achievement of the planned results of mastering the educational program, presented in Table 3.

Table 3-Results of training in the discipline, correlated with the planned results of mastering the OPOP in higher education

Competence	**of Knowledge**	**Skills**	**Skills**
1	2	3	4
Ability to analyze and summarize data on the operation of technological equipment, monitor, provide technical support and manage technological processes in the oil and gas industry (PC-2)	- well designs, perforation methods and methods of development of oil and gas wells; - theoretical foundations of fluid lifting from wells; - structures and flow modes of gas-liquid flows in production columns and elevator pipes of oil and gas wells.	- design well structures, drill string layouts.	- methods of technological calculation of well parameters during pumping operation
Ability to ensure safe and efficient operation and operation of technological equipment in the oil and gas industry (PC-3)	- basic methods of mechanized lifting of fluid from wells; - basic design of the main types of deep-pumping and ground equipment of wells.	- demonstrate and correct technological processes during the operation of wells for various purposes; - apply and maintain technological equipment used in oil production, as well as in the collection and preparation of well products.	- methods of designing and selecting equipment for the operation of wells by submersible pumping units for oil production .

4. Scope of the discipline and types of academic work

Table 3-Scope of the discipline and types of academic work
for full-time education

Type of academic work		Total, acc. hours	Module 5
Classroom activities		36	36
including:			
Lectures (L)		9	9
Practical/seminar sessions (PZ)		27	27
Laboratory work (LR)			
Course project/course work			
Independent work (SRS), including control		108	108
Type of certification test			Set-off
Total labor	intensity of academic hours	144	144
	credits	4	4

5. Content of the discipline

Table 4-Content of disciplines and types of classes
for fulltime education

n/a number	Name of the section of the discipline / topic of the lesson	Lecturehall.	Pract. / workshop.	Lab.	SRS	Just an hour.
	5 MODULE					
1.	**Section #1. General information about submersible pumping equipment for cyclic well operation**	**2**	**6**		**15**	**23**
	Topic 1.1. Basic parameters of the EDS operation. Diagram and main elements of the submersible centrifugal pump installation. Influence of the density and viscosity of the pumped liquid on the ESP characteristic.	1	3		8	12
	Topic 1.2. The concept of cyclic well operation. Reasons for introduction of cyclicoperation of wells equipped with ESP.	1	3		7	11
2.	**Section #2. Efficiency of cyclic operation**	**2**	**6**		**26**	**34**
	Topic 2.1. Application of cyclic operation for low-flow and medium-flow wells. Technical and technological solutions for the implementation of cyclic operation of wells with ESP.	1	3		13	17
	Topic 2.2. Industrial experience in implementing cyclic operation in oil fields.	1	3		13	17
3.	**Section #3. Limitations of the use of cyclic well operation**	**5**	**15**		**31**	**51**
	Topic 3.1. Design limitations of the introduction of cyclic operation.	2	6		10	18

n/a number	Name of the section of the discipline / topic of the lesson	Lecturehall.	Pract. / workshop.	Lab.	SRS	Just an hour.
	Topic 3.2. Technological limitations of well operation in the mode of cyclic short-term withdrawals	1	3		8	12
	Topic 3.3. Prospects for the cyclic well operation method.	2	6		13	21
	Credit				**36**	**36**

6. Educational technologies

Organization of classes in the discipline Cyclic operation of wells equipped with ESP is carried out according to the following types of educational work: lectures, practical exercises/ seminars.

Implementation of the competence-based approach within the framework of the training area 21.04.01 Oil and gas engineering / Technologies of oil and gas production and transportation provides for a combination of contact work with the teacher and extra-curricular independent work of students in the educational process for a more complete formation and development of their professional skills.

Lectures are held in a live audience, including using a multimedia projector in the form of an educational presentation. The main points of the lecture sessions are outlined by students, individual topics (parts of topics and sections) are offered for self-study with the obligatory compilation of a summary (checked by the teacher during the current control).

The purpose of practical classes / seminars is for students to gain knowledge and develop practical skills in solving complex issues related to the operation of oil wells equipped with submersible electric centrifugal pumps. To achieve these goals, both traditional forms of work are used – problem solving, working with technological and csocialized materials and documents, while using interactive methods-group work, analysis of specific situations, business game, etc.

Group work when analyzing a specific situation, as well as when performing laboratory work in a subgroup, develops the ability to analyze and diagnose problems. Using the method of analyzing a specific situation, students develop such qualification qualities as the ability to clearly formulate and express their position, the ability to communicate, discuss, perceive and evaluate information received in verbal form. Practical classes are held in special classrooms equipped with the necessary visual materials.

Independent work is carried out in an individual format based on the teaching materials of the discipline (*appendices2-4*). The level of mastering the material on independently studied questions of the course is checked during the current control and certification tests (exam and/or credit).) by discipline.

7. Educational, methodological and informational support of the discipline

Basic literature:

1. Bolsunovskaya L. M. [et al.] Petroleum Engineering. Course book = Oil and gas engineering. Book for students: a study guide/ edited by L. M. Bolsunovskaya, R. N. Abramova, and I. A. Matveenko. - Electron. dan. Tomsk: TPU Publ., 2014, 742 p.

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

2. Tetelmin V. V. Neftegazovoe delo [Oil and gas engineering]. Training manual / V. V.Tetelmin, V. A. Yazev.-2nd ed.; Dolgoprudny: Publishing House "Intellect", 2014. - 800 p.

http://lib.rudn.ru

3. Tetelmin V. V. Osnovy bureniya na neft i gaz: Uchebnoe posobie [Fundamentals of drilling for oil and gas: A textbook]. Dolgoprudny: Intellekt, 3rd ed., 2014, 296 p.

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

Additional literature:

1. Sayfullin I. Sh.,Tetelmin V. V., Yazev V. A. Fizicheskie osnovy dobycha nefti: Uchebnoe posobie [Physical fundamentals of oil production: A textbook]. Dolgoprudny: Intellekt Publ., 2013, 328 p.

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

2. Arbuzov V. N., Kurganova E. V. Sbornik zadach po tekhnologii dobycheniya neftya i gaza v oslozhnennykh usloviyakh: praktikum: uchebnoe posobie [Collection of problems on oil and gas production technology in complicated conditions]. - Electron. dan. Tomsk: TPU Publ., 2014, 68 p. (in Russian)

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

Periodicals:

1. Neftegazovaya Vertikal magazine http://ngv.ru
2. Gas Industry Magazine http://neftegas.info/gasindustry/
3. Magazines "Neftegaz.ru" http://www.neftegaz.ru

Resources of the Internet information and telecommunications network»:

1. RUDN University EBS and third-party EBS that university students have access to on the basis of concluded contracts:

-RUDN University Electronic Library System-RUDN University Electronic Library System http://lib.rudn.ru/MegaPro/Web

- EBS "University Library online" http://www.biblioclub.ru
- EBS Urite http://www.biblio-online.ru
- EBS "Student's consultant" www.studentlibrary.ru
- EBS "Lan" http://e.lanbook.com/

2. Websites of ministries, departments, services, industrial enterprises and companies whose activities are relevant for this discipline:

- Website of the Ministry of Energy of the Russian Federation https://minenergo.gov.ru
- Gazprom PJSC http://www.gazprom.ru
- PJSC LUKOIL http://www.lukoil.ru

3. Databases and search engines:

- electronic fund of legal and regulatory and technical documentation http://docs.cntd.ru/
- Yandex search engine https: / /www.yandex.ru/

- Google search engine https://www.google.ru/
- SCOPUS abstract database http://www.elsevierscience.ru/products/scopus/

Software:

1. Specialized software for conducting lectures, laboratory and practical classes and independent work of students:

- Specialized software "TransasShelf 6000 DrillingSimulator»
- License for ARMARIS software for TESP ESP

Methodological materials for students ' independent work and study of the discipline (also available in the corresponding section of the discipline in the TUIS RUDN University).):

1. Course of lectures on the discipline Cyclic operation of wells equipped with ESP (*Appendix 2*).
2. Guidelines for independent work of students in the discipline Cyclic operation of wells equipped with ESP (*Appendix 3*).

8. Material and technical support of the discipline

Table 5-Material and technical support of the discipline

Audience with a list of material and technical support	**Location**
Classroom # 333. A set of specialized furniture; technical means: projection screen; NEC V302X multimedia projector; DEPO Neos 220	St system unit. Podolskoe Shosse, 8k. 5
Laboratory of Mining machines room No. 358. Computer with pre-installed licensed software "ARMARIS" Intel processor Soge15, 7 pcs; "Wellhead fittings" - mock-up stand; 3D LED TV on a stand with a screen diagonal of 32 inches; Mock-up controller "Electon-09 1" from SU "Electon 05-250 " in a compact design	Ul. Podolskoe Shosse, 8k. 5
Laboratory of Mining machines, room No. 362. Set of specialized furniture; Simulator-simulator of drilling "Transas SHELF 6000 Drill"; Additional place of the trainee to the simulator-simulator of drilling "Transas SHELF 6000 Drill"	Ul. Podolskoe Shosse, 8k. 5
Laboratory of Hydrodynamic processes of oil and gas production, room No. 341. Ejector; Working table of the stand, instrumentation andcontrol valves; Tank; Stand-model of the pump-ejector system, left view; Laser diode; Liquid column; Air compressor; Gas supply system to the column; Gas meter; Pressure gauge; Photodiode; Digital oscilloscope.	Ul. Podolskoe Shosse, 8k. 5

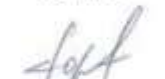
9. Evaluation Funds Fund

Materials for assessing the level of mastering the educational material of the discipline(evaluation materials), including a list of competencies, specifying stages of their formation, description of the indicators, and criteria of assessment competencies at different stages of their formation, the description of the scales of assessment, typical assignments or other materials necessary for the evaluation of knowledge, skills, and (or) operational experience that characterize the stages' formation of competencies in the process of mastering the educational program, training materials, defining the procedure of assessment of

the knowledge, skills, proficiency and (or) operational experience that characterize the stages of competence formation have been developed in full and are available to students, on the discipline page, on the website of the RUDN University (TUIS RUDN).

The program is designed in accordance with the requirements of the RUDN University OS.

Developer:

Professor of the Department of Subsurface Use and Oil and Gas Engineering		A.N. Drozdov
position	signature	initials, surname
Teaching assistant of the Department of Subsurface Use and Oil and Gas Engineering		Ya.A. Gorbyleva
position	signature	initials, surname

Program Manager

Professor of the Department of Subsurface Use and Oil and Gas Engineering		V.M. Kapustin
position	signature	initials, surname

Director of the Department of Subsurface Use and Oil and Gas Engineering		A.E. Kotelnikov
position	signature	initials, surname

Federal State Autonomous Educational Institution
of Higher Education
«Peoples ' Friendship University of Russia»

Engineering Academy

WORKING PROGRAM OF THE DISCIPLINE

Name of the discipline: Economics and management of oil and gas production

Training area: 21.04.01 Oil and gas engineering

Program (focus (profile)): Oil and gas production and transportation technologies

1. Purpose and objectives of the discipline:

The purpose of mastering the discipline "Economics and management of oil and gas production" is the formation of a set of knowledge for the effective implementationof production management processes at oil and gas industry enterprises and in their structural divisions based on organizational and economic knowledge.

Study of the discipline "Economics and management of oil and gas production" predousmatrial the acquisition of practical management skills in the study of the world market of oil and gas, outcomes and factors of production, methods of evaluating the efficiency of resource use in the oil and gas production, the formation of the production costs and financial results in the oil and gas production, maintenance and management functions of the enterprise: essence and types of planning; types of organizational structures management; motivation; control; information; management decisions.

2. The place of the discipline in the structure of the OP HE:

Discipline "Economics and management of oil and gas production" refers toVariable component of the Mandatory part of Block 1 of the curriculum.

Table 1 shows the previous and subsequent disciplines aimed at the formation of discipline competencies in accordance with the matrix of competencies of the Higher Professional Education Department.

Table 1

Previous and subsequent disciplines aimed at:
on the formation of competencies

n	a Code and name of the competence	Previous disciplines	Subsequent disciplines
Competencies			
	UC-3. Able to organize and manage the team's work, developing a team strategy to achieve the goal. OPC-4. It is able to find and process information required for decision-making in scientific research and in practical technical activities. OPC-6. Able to participate in the implementation of basic and additional professional educational programs, using special scientific and professional knowledge	Disciplines of the previous level of education	Project management in the oil and gas industry State final certification

3. Requirements for the results of mastering the discipline:

The process of studying the discipline "Economics and management of oil and gas production" is aimed at developing the following competencies:

Table 2

Emerging competencies

Competencies	Name of the competence	Indicators of achievement of competence achievement
UC-3	Able to organize and lead the work of the team, developing team strategy to achieve the objectives	Knows the features of the behavior of the selected groups of people with whom they work/interact, taking them into account in their activities (selection of categories of groups of people is an educational organization, depending on the purpose of training by the age peculiarities, ethnic or religious grounds, socially unprotected segments of the population, etc) Knows how to anticipate the results (consequences) of personal actions and plans a sequence of steps to achieve a given result.anticipates results (consequences) of personal

		actions and plans a sequence of steps to achieve the specified result Has the skills to effectively use the cooperation strategy to achieve the goal, determine their role in the team; effectively interact with other team members, including participating in the exchange of information, knowledge and experience, and presenting the results of the team's work
OPC-4	It is able to find and process information required for decision-making in scientific research and in practical technical activities.	Knows the technology of conducting standard experiments on standard equipment in the laboratory and in production; a set of modern methods for processing the results of research and practical technical activities using existing equipment, devices and materials Able to search, analyze and select the necessary information, organize, convert, save and send it; to analyze the internal logic of scientific knowledge; to justify their ideological and social position and to apply the acquired knowledge in areas not related to professional activities; to assess the risks of innovation; to collate and process the results of research activities using standard equipment, instruments and materials Proficient in the technique of experimentation using software packages; the main directions of development of innovative technologies in the oil and gas industry; skills in developing innovative approaches to specific technologies using automated control systems
OPC-6	Able to participate in the implementation of basic and additional professional educational programs, using special scientific and professional knowledge	Knows the requirements of educational standards, the regulatory framework for the organization of educational activities, the value bases of education and professional activity, the essence, structure, possibilities of using the educational environment to achieve personal, metasubject and subject learning outcomes and ensure the quality of the educational subject taught, the requirements for the safety of the educational environment He is able to communicate with the audience, get listeners interested, and independently plan academic work within the framework of an educational program in subjects based on his own experience He has business communication skills, the basics of management in the organization of team work when performing a specific research task.

4. Scope of the discipline and types of academic work:

The total labor intensity of the discipline is **3 credit units (108 hours).**

Type of academic work	**Total hours**	**Module**
		5
Classroom sessions (total)	**36**	36
Including:		
Lectures	**18**	18

Practical exercises (PZ)	**18**	18
Seminars (C)	**-**	-
Laboratory work (LR)	**-**	-
Independent work (total)	**72**	72
Control	**-**	-
Total labor intensity hour	**108**	108
creditunits	**3**	3

5. Content of the discipline

5.1. Content of the discipline sections

n/a number	Name of the section of the discipline / topic of the lesson	Lecturehall.	Prakt. / workshop.	Lab.	SRS	Just an hour.
	5 Module					
1.	**Section #1. Organizational bases of functioning of enterprises**	**5**	**12**	**-**	**19**	**36**
	Topic 1.1. Industrial enterprise as a complex production system. Organizational and legal forms of commercial enterprises. Corporate forms of management in the oil and gas industry.	3	6	-	10	19
	Topic 1.2. General characteristics of oil and gas complex enterprises as an organization's object. Types of industrial production. Composition and structure of the production enterprise.	2	6	-	9	17
2.	**Section 2. Efficiency of implementation of new equipment and advanced technology at oil and gas industry facilities**	**6**	**11**	**-**	**19**	**36**
	Topic 2.1. Planning of new equipment and advanced technology implementation processes at oil and gas industry facilities	3	5	-	10	18
	Topic 2.2. Determination of the effect of implementing measures aimed at improving the reliability and efficiency of technological equipment for oil and gas production.	3	6	-	9	18
3.	**Section #3. Organization of innovative activity of the enterprise**	**6**	**11**	**-**	**19**	**36**
	Topic 3.1. Content and objectives of innovation activity.	2	4	-	6	12
	Topic 3.2. Organization of research work at the enterprise. Organization of design preparation of production.	2	3	-	6	11
	Topic 3.3. Organization of technological preparation of production. Strategy for the	2	4	-	7	13

n/a number	Name of the section of the discipline / topic of the lesson	Lecturehall.	Prakt. / workshop.	Lab.	SRS	Just an hour.
	development of the enterprise's production potential.					
	Credit	-	-	-	-	-

5.2. Sections of disciplines and types of classes (full-time education)

	Name of the discipline section	Lecturehall.	Prakt. zan.	Lab. zan.	Semin	SRS	Just an hour.
	5 module						
1.	Organizational bases of functioning of enterprises	6	6	-	-	24	36
2.	Efficiency of implementation of new equipment and advanced technology at oil and gas facilities	6	6	-	-	24	36
3.	Organization of innovative activity of the enterprise	6	6	-	-	24	36
	Offset						**18**

6. A laboratory workshop is not provided.

7. Practical exercises (seminars)

n/	a number of the section (topic) of the discipline	Topics ofpractical classes	Laborcapacity (hour.) OFO
1.	1.	Organizational bases of functioning of enterprises	6
2.	2.	Efficiency of implementation of new equipment and advanced technology at oil and gas facilities	6
3.	3.	Organization of innovative activity of the enterprise	6
	Total		**18**

8. Material and technical support of the discipline:

Audience with a list of material and technical support	Location
Classroom for conducting lecture-type classes: room 335 Set of specialized furniture; technical means: projection screen; SANYO PROxtraX multimedia projector; DEPO Neos system unit 220	Ul. Podolskoe Shosse, 8k. 5
Training room for conducting seminar-type classes: room No. 356 Set of specialized furniture; chalkboard; NEC PLASMA monitor MONITO MODEL PX-42XM1G; system unit DEPO Neos 220	Ul. Podolskoe Shosse, 8k. 5
Training room for conducting seminar-type classes: laboratory of mining machines, room No. 362 Set of specialized furniture; Simulator-simulator of drilling "Transas SHELF 6000 Drill"; Additional place of the trainee to the simulator-simulator of drilling "Transas SHELF 6000 Drill"	Ul. Podolskoe Shosse, 8k. 5

9. Information support of the discipline:

The implementation of the educational process in the discipline is based on the use of the following

information technologies::

1. RUDN University EBS and third-party EBS that university students have access to on the basis of concluded contracts:

-RUDN University Electronic Library System-RUDN University Electronic Library System http://lib.rudn.ru/MegaPro/Web

- EBS "University Library online" http://www.biblioclub.ru
- EBS Urite http://www.biblio-online.ru
- EBS "Student's consultant" www.studentlibrary.ru
- EBS "Lan" http://e.lanbook.com/

2. Websites of ministries, departments, services, industrial enterprises and companies whose activities are relevant for this discipline:

- Website of the Ministry of Energy of the Russian Federation https://minenergo.gov.ru
- Gazprom PJSC http://www.gazprom.ru
- PJSC LUKOIL http://www.lukoil.ru

3. Databases and search engines:

- electronic fund of legal and regulatory and technical documentation http://docs.cntd.ru/
- Yandex search engine https: / /www.yandex.ru/
- Google search engine https://www.google.ru/
- SCOPUS abstract database http://www.elsevierscience.ru/products/scopus/

10. Educational, methodological and informational support of the discipline:

Basic literature:

1. Krayushkina M. V. Ekonomika i Ekonomika i upravlenie neftegazovym proizvodstvom: uchebnoe posobie [Economics and Economics and Management of oil and gas production: a textbook]. Ministry of Education and Science of the Russian Federation, Federal State Autonomous Educational- Institution of Higher Professional Education "North Caucasus Federal University". Stavropol: NCFU Publ., 2014, 156 p. (in Russian)
http://biblioclub.ru/index.php?page=book&id=457397

2. Eremenko O. V. Innovative technologies of personnel management in the oil and gas industry : training manual / O. V. Eremenko. - Moscow. Berlin : Direct-Media, 2017, 192 p. (in Russian):
http://biblioclub.ru/index.php?page=book&id=455580

Additional literature:

1. Zhukov B. M.:, Tkacheva E. N. Issledovanie sistem upravleniya : uchebnik [Research of control systems: textbook]. - Moscow: Publishing and Trading Corporation "Dashkov & Co.", 2017. - 207 p. http://biblioclub.ru/index.php?page=book&id=495774

2. AntsupovA. Ya. Strategicheskoe upravlenie [Strategic Management].Antsupov; Institute of Development Strategy. - 3rd edition, ispr. and pererab. Moscow: Technosphere Publ., 2015, 344 p.
http://biblioclub.ru/index.php?page=book&id=4448483. Mstislavskaya L. P. Neftegazovoe proizvodstvo (Voprosy, problemy, resheniya): Uchebnoe posobie [Oil and gas production (Voprosy, problemy, resheniya)].

Online resources:

http:// www.rmpi.ru
http://mining-media.ru
http://geomar.ru/articles/pmpk.html
http://kopimash.ru
http://yumz.ru/
http://www.ugolinfo.ru/

http://www.complexdoc.ru/
http://miningwiki.ru -mining encyclopedia
http://mining-enc.ru -mountain encyclopedia
http:// spelesto.ucoz.ru -articles about the history of mining
http://www.idsas.ru/ http://moregost.ru/

11. Guidelines for students on mastering the discipline (module):

Independent work of students is carried out on the instructions of the teacher, without his direct participation. Independent work of students should be systematic.

Working in practical classes involves the active participation of students. During practical classes, the student is also recommended to take notes on the main content of the course. When teaching a discipline, it is methodically advisable to highlight the most important points in each section of the course and focus students ' attention on them.

In the course of mastering the discipline, as part of independent work, the student: works with literature in the RUDN University library; uses electronic library resources, resources of the information and communication network "Internet".

Features of implementation of the discipline for disabled people and persons with disabilities.

Training in the discipline of disabled people and persons with disabilities (hereinafter referred to as HIA) is carried out by the teacher, taking into account the peculiarities of psychophysical development, individual capabilities and health status of such students.

For students with musculoskeletal disorders and hearing disabilities, lectures and practical classes are accompanied by multimedia tools and handouts.

For students with visual disabilities, it provides for the use of technical means to enhance residual vision, as well as the possibility of developing audio materials.

In this discipline, training of disabled people and persons with disabilities can be carried out both in the classroom and remotely using the capabilities of the electronic educational environment (Training Portal) and e-mail.

Training of disabled people and persons with disabilities can be carried out according to an approved individual schedule, taking into account the peculiarities of their psychophysical development and health status, which implies individualization of the content, methods, pace of learning activities of the student, the ability to monitor specific actions of the student when solving specific tasks, making, if necessary, the required adjustments to the learning process.

It provides for individual consultations (including consultation via e-mail), provision of additional educational and methodological materials (depending on the diagnosis).

12. Fund of assessment funds for conducting intermediate certification of students in the discipline (module):

Materials for assessing the level of mastering the educational material of the discipline(evaluation materials), including a list of competencies, specifying stages of their formation, description of the indicators, and criteria of assessment competencies at different stages of their formation, the description of the scales of assessment, typical assignments or other materials necessary for the evaluation of knowledge, skills, and (or) operational experience that characterize the stages' formation of competencies in the process of mastering the educational program, training materials, defining the procedure of assessment of the knowledge, skills, proficiency and (or) operational experience that characterize the stages of competence formation have been developed in full and are available to students, on the discipline page, on the website of the RUDN University (TUIS RUDN).

The program is designed in accordance with the requirements of the RUDN University OS.

Developer:

Associate Professor of the Department of Subsurface Use and Oil and Gas Affairs		T.V. Chekushina
position	signature	initials, surname

Program Manager

Professor of the Department of Subsurface Use and Oil and Gas Engineering		V.M. Kapustin
position	signature	initials, surname

Director of the Department of Subsurface Use and Oil and Gas Engineering		A.E. Kotelnikov
position	signature	initials, surname

Federal State Autonomous Educational Institution
of Higher Education
«Peoples ' Friendship University of Russia»

Engineering Academy

WORKING PROGRAM OF THE DISCIPLINE

Name of the discipline: Well operation with submersible hydraulic jet pumps

Training area: 21.04.01 Oil and gas engineering

Program (focus (profile)): Oil and gas production and transportation technologies

1. Purpose and objectives of the discipline

The purpose of mastering the discipline Well operation with submersible hydraulic jet pumps is aimed at students ' acquisition of theoretical knowledge and practical skills in solving complex issues related to the use of jet equipment for well operation and efficient field development. Training students to identify problems and select jet devices for the conditions of wells in various fields. General information about the use of hydro-jet technology in the operation of production wells and in general in field development.

The main **objectives** of the discipline are:
- study of methods and calculation of the characteristics and flow part of a jet apparatus for oil production using a hydraulic jet unit;
- study of existing types of installations for water jet operation;
- acquisition of skills in choosing a particular equipment;
- mastering the principles of selecting candidate wells for hydro-jet operation.

2. Place of the discipline in the structure of the educational program

Discipline Well operation by submersible water jet pumps is a variable part of Block 1 of the curriculum. Its study is based on the material of previous disciplines, and it is also basic for studying subsequent disciplines of the curriculum, the list of which is presented in Table 1.

Table 1-List of previous and subsequent disciplines

n/a number	Previous disciplines	Subsequent disciplines
1	Simultaneously-separate operation of wells	Commercial Geophysics / Current development of unconventional hydrocarbon production in the world
2	Reservoir pressure maintenance systems using multi-stage vane pumps	Output of wells equipped with ESP to mode
3	Software package for assessing the reliability of submersible equipment based on operational data	Methods for improving the ESP resource
4	Universal method of selecting submersible vane pump installations for oil production	State final certification
5	Submersible vane pump installations for oil production	

3. List of planned results of training in the discipline, correlated with the planned results of mastering the educational program

Discipline Well operation with submersible water jet pumps is aimed at developing the following competencies for students:

- with the ability to analyze and summarize data on the operation of technological equipment, monitor, provide technical support and manage technological processes in the oil and gas industry (PC-2);

-it is responsible for ensuring safe and efficient operation and operation of technological equipment in the oil and gas industry (PC-3).

The result of training in the discipline is knowledge, skills, abilities and (or) experience of activity that characterize the stages of competence formation and ensure the achievement of the planned results of mastering the educational program, presented in Table 3.

Table 3-Results of training in the discipline, correlated with the planned results of mastering the OPOP in higher education

Competence	**of Knowledge**	**Skills**	**Skills**
1	2	3	4
Ability to analyze and summarize data on the operation of technological equipment, monitor, provide technical support and manage technological processes in the oil and gas industry (PC-2)	- well designs, perforation methods and methods of development of oil and gas wells; - theoretical foundations of fluid lifting from wells; - structures and flow modes of gas-liquid flows in production columns and elevator pipes of oil and gas wells.	- design well structures, drill string layouts.	- methods of technological calculation of well parameters during pumping operation
Ability to ensure safe and efficient operation and operation of technological equipment in the oil and gas industry (PC-3)	- basic methods of mechanized lifting of fluid from wells; - basic design of the main types of deep-pumping and ground equipment of wells.	- demonstrate and correct technological processes during the operation of wells for various purposes; - apply and maintain technological equipment used in oil production, as well as in the collection and preparation of well products.	- methods of designing and selecting equipment for the operation of wells by submersible water jet installations for oil production .

4. Scope of the discipline and types of academic work

Table 3-Scope of the discipline and types of academic work
for full-time education

Type of academic work	Total,	Module

		acc. hours	5
Classroom activities		36	36
including:			
Lectures (L)		9	9
Practical/seminar sessions (PZ)		27	27
Laboratory work (LR)			
Course project/course work			
Independent work (SRS), including control		108	108
Type of certification test			Set-off
Total labor	intensity of academic hours	144	144
	credits	4	4

5. Content of the discipline

Table 4-Content of discipliness and types of classes
for fulltime education

n/a number	Name of the section of the discipline / topic of the lesson	Lecturehall.	Pract. / workshop.	Lab.	SRS	Just an hour.
	5 MODULE					
1.	**Section #1. The principle of operation of the jet pump, the use of jet pumps in the development and operation of wells**	**2**	**6**		**15**	**23**
	Topic 1.1. Basic elements and operating principle of the jet unit.	1	3		8	12
	Topic 1.2. Types of hydro-jet devices for well development and oilproduction,jet pumping unit	1	3		7	11
2.	**Section #2. Flow chart of water jet operation of wells driven by a power submersiblecentrifugal pump**	**2**	**6**		**26**	**34**
	Topic 2.1. Method of calculation of a water jet pump, typical layout of an elevator, ground equipment strapping, selection of the permissible depression value on the formation.	1	3		13	17
	Topic 2.2. Calculation ofa water jet pumping unit for well operation	1	3		13	17
3.	**Section #3. Development of the hydrojet method of well operation**	**5**	**15**		**31**	**51**
	Topic 3.1. Operation of wells with packer installations of hydraulic jet pumps, operation of wells without packer	2	6		10	18
	Topic 3.2. Operation of wells by installations of water jet pumps with a double-row elevator, diagram of a mini-power station driven by an ECN	1	3		8	12

n/a number	Name of the section of the discipline / topic of the lesson	Lecturehall.	Pract. / workshop.	Lab.	SRS	Just an hour.
	Topic 3.3. Prospects for thedevelopment of the hydraulic jet method of oil production, selection of equipment for improving the oil production system, advantages and disadvantages of installing hydraulic jet pumps	2	6		13	21
	Credit				**36**	**36**

6. Educational technologies

Organization of classes by discipline Operation of wells by submersible water jet pumps is carried out according to the following types of training work: lectures, practical exercises/ seminars.

Implementation of the competence-based approach within the framework of the training area 21.04.01 Oil and gas engineering / Technologies of oil and gas production and transportation provides for a combination of contact work with the teacher and extracurricular independent work of students in the educational process for a more complete formation and development of their professional skills.

Lectures are held in a live audience, including using a multimedia projector in the form of an educational presentation. The main points of the lecture sessions are outlined by students, individual topics (parts of topics and sections) are offered for self-study with the obligatory compilation of a summary (checked by the teacher during the current control).

The purpose of practical classes / seminars is for students to gain knowledge and develop practical skills in solving complex issues related to the operation of oil wells equipped with jet units. To achieve these goals, both traditional forms of work are used – problem solving, working with technological and socialized materials and documents, while using interactive methods-group work, analysis of specific situations, business game, etc.

Group work when analyzing a specific situation, as well as when performing laboratory work in a subgroup, develops the ability to analyze and diagnose problems. Using the method of analyzing a specific situation, students develop such qualification qualities as the ability to clearly formulate and express their position, the ability to communicate, discuss, perceive and evaluate information received in verbal form. Practical classes are held in special classrooms equipped with the necessary visual materials.

Independent work is carried out in an individual format based on the teaching materials of the discipline (*appendices2-5*). The level of mastering the material on independently studied questions of the course is checked during the current control and certification tests (exam and/or credit).) by discipline.

7. Educational, methodological and informational support of the discipline

Basic literature:

1. Bolsunovskaya L. M. [et al.] Petroleum Engineering. Course book = Oil and gas engineering. Book for students: a study guide/ edited by L. M. Bolsunovskaya, R.N.

Abramova, I. A. Matveenko. - Electron. dan. Tomsk: TPU Publ., 2014, 742 p.
https://e.lanbook.com/book/62912
2. Tetelmin V. V. Neftegazovoe delo [Oil and gas engineering]. Training manual / V. V.Tetelmin, V. A. Yazev. - 2nd ed.; Dolgoprudny: Publishing House "Intellect", 2014. - 800 p.
http://lib.rudn.ru
3. Tetelmin V. V. Osnovy bureniya na neft i gaz: Uchebnoe posobie [Fundamentals of drilling for oil and gas: A textbook]. Dolgoprudny: Intellekt, 3rd ed., 2014, 296 p.
http://znanium.com/catalog/product/478822

Additional literature:

1. Sayfullin I. Sh.,Tetelmin V. V., Yazev V. A. Fizicheskie osnovy dobycha nefti: Uchebnoe posobie [Physical fundamentals of oil production: A textbook]. Dolgoprudny: Intellekt Publ., 2013, 328 p.
http://znanium.com/catalog/product/423812
2. Arbuzov V. N. Sbornik zadach po tekhnologii dobycheniya neftya i gaza v oslozhnennykh usloviyakh: praktikum: uchebnoe posobie [Collection of problems on oil and gas production technology in complicated conditions]. Arbuzov, E. V. Kurganova. - Electron. dan. Tomsk: TPU Publ., 2014, 68 p. (in Russian)
https://e.lanbook.com/book/82862

Periodicals:

1. Neftegazovaya Vertikal magazine http://ngv.ru
2. Gas Industry Magazine http://neftegas.info/gasindustry/
3. Magazines "Neftegaz.ru" http://www.neftegaz.ru

Resources of the Internet information and telecommunications network»:

1. RUDN University EBS and third-party EBS that university students have access to on the basis of concluded contracts:

-RUDN University Electronic Library System-RUDN University Electronic Library System http://lib.rudn.ru/MegaPro/Web
- EBS "University Library online" http://www.biblioclub.ru
- EBS Urite http://www.biblio-online.ru
- EBS "Student's consultant" www.studentlibrary.ru
- EBS "Lan" http://e.lanbook.com/

2. Websites of ministries, departments, services, industrial enterprises and companies whose activities are relevant for this discipline:

- Website of the Ministry of Energy of the Russian Federation https://minenergo.gov.ru
- Gazprom PJSC http://www.gazprom.ru
- PJSC LUKOIL http://www.lukoil.ru

3. Databases and search engines:

- electronic fund of legal and regulatory and technical documentation http://docs.cntd.ru/

- Yandex search engine https: / /www.yandex.ru/
- Google search engine https://www.google.ru/
- SCOPUS abstract database http://www.elsevierscience.ru/products/scopus/

Software:

1. Specialized software for conducting lectures, laboratory and practical classes and independent work of students:

- Specialized software "TransasShelf 6000 DrillingSimulator»
- License for ARMARIS software for TESP ESP

Methodological materials for students ' independent work and study of the discipline (also available in the corresponding section of the discipline in the TUIS RUDN University).):

1. Course of lectures on the discipline Operation of wells by submersible water jet pumps (*Appendix 2*).
2. Guidelines for independent work of students in the discipline Operation of wells by submersible water jet pumps (*Appendix 3*).

8. Material and technical support of the discipline

Table 5-Material and technical support of the discipline

Audience with a list of material and technical support	**Location**
Classroom # 333. A set of specialized furniture; technical means: projection screen; NEC V302X multimedia projector; DEPO Neos 220	St system unit. Podolskoe Shosse, 8k. 5
Laboratory of Mining machines room No. 358. Computer with pre-installed licensed software "ARMARIS" Intel processor Soge15, 7 pcs; "Wellhead fittings" - mock-up stand; 3D LED TV on a stand with a screen diagonal of 32 inches; Mock-up controller "Electon-09 1" from SU "Electon 05-250 " in a compact design	Ul. Podolskoe Shosse, 8k. 5
Laboratory of Mining machines, room No. 362. Set of specialized furniture; Simulator-simulator of drilling "Transas SHELF 6000 Drill"; Additional place of the trainee to the simulator-simulator of drilling "Transas SHELF 6000 Drill"	Ul. Podolskoe Shosse, 8k. 5
Laboratory of Hydrodynamic processes of oil and gas production, room No. 341. Ejector; Working table of the stand, instrumentation and control valves; Tank; Stand-model of the pump-ejector system, left view; Laser diode; Liquid column; Air compressor; Gas supply system to the column; Gas meter; Pressure gauge; Photodiode; Digital oscilloscope.	Ul. Podolskoe Shosse, 8k. 5

9. Evaluation Funds Fund

Materials for assessing the level of mastering the educational material of the discipline(evaluation materials), including a list of competencies, specifying stages of their formation, description of the indicators, and criteria of assessment competencies at different stages of their formation, the description of the scales of assessment, typical assignments or other materials necessary for the evaluation of knowledge, skills, and (or) operational experience that characterize the stages' formation of competencies in the process of

mastering the educational program, training materials, defining the procedure of assessment of the knowledge, skills, proficiency and (or) operational experience that characterize the stages of competence formation have been developed in full and are available to students, on the discipline page, on the website of the RUDN University (TUIS RUDN).

The program is designed in accordance with the requirements of the RUDN University OS.

Developer:

Professor of the Department of Subsurface Use and Oil and Gas Engineering		A.N. Drozdov
position	signature	initials, surname
Teaching assistant of the Department of Subsurface Use and Oil and Gas Engineering		Ya.A. Gorbyleva
position	signature	initials, surname

Program Manager

Professor of the Department of Subsurface Use and Oil and Gas Engineering		V.M. Kapustin
position	signature	initials, surname

Director of the Department of Subsurface Use and Oil and Gas Engineering		A.E. Kotelnikov
position	signature	initials, surname

Federal State Autonomous Educational Institution
of Higher Education
«Peoples ' Friendship University of Russia»

Engineering Academy

WORKING PROGRAM OF THE DISCIPLINE

Name of the discipline: Information technologies in the oil and gas industry

Training area: 21.04.01 Oil and gas engineering

Program (focus (profile)): Oil and gas production and transportation technologies

1. Purpose and objectives of the discipline

The purpose of mastering the discipline Information technologies in the oil and gas industry is the acquisition of students ' theoretical knowledge and practical skills in solving complex issues related to the use of equipment when launching wells for further operation. Teaching students about various complications that occur during the well commissioning process. General information about submersible pumping units and additional equipment.

The main **objectives** of the discipline are:
- study of methods and output of a well equipped with a submersible electric centrifugal pump, to the operating mode;
- study of the ESP operation characteristics when the well is put into operation;
- acquisition of skills in choosing a particular equipment;
- mastering the methodology for calculating equipment characteristics.

2. Place of the discipline in the structure of the educational program

Discipline Information technologies in the oil and gas industry belongs to the variable part of Block 1 of the curriculum. Its study is based on the material of previous disciplines, and it is also basic for studying subsequent disciplines of the curriculum, the list of which is presented in Table 1.

Table 1-List of previous and subsequent disciplines

n/a number	Previous disciplines	Subsequent disciplines
1	Disciplines of the previous level of education	Simultaneously-separate operation of wells
2		Reservoir pressure maintenance systems using multi-stage vane pumps
3		Software package for assessing the reliability of submersible equipment based on operational data
4		Universal method of selecting submersible vane pump installations for oil
5		Submersible vane pump installations for oil
6		Methods for improving the ESP resource

3. List of planned results of training in the discipline, correlated with the planned results of mastering the educational program

Discipline Information technologies in the oil and gas industry is aimed at developing the following competencies in students (Table 2):

Table 2-List of competencies

Competence Cipher	Explanation of the acquired competence

of the Criminal Code-4	Able to apply modern communication technologies in the state language of the Russian Federation and foreign language (s) for academic and professional interaction.
OPC-3	Able to develop scientific and technical, project and service documentation, draw up scientific and technical reports, reviews, publications, reviews.
AboutPC-4	It is able to find and process information required for decision-making in scientific research and in practical technical activities.

The result of training in the discipline is knowledge, skills, abilities and (or) experience of activity that characterize the stages of competence formation and ensure the achievement of the planned results of mastering the educational program, presented in Table 3.

Table 3-Results of training in the discipline, correlated with the planned results of mastering the OPOP in higher education

Competence	**of Knowledge**	**Skills**	**Skills**
1	2	3	4
ability to use modern communication technologies in the state language of the Russian Federation and foreign(s) language(s) for academic and professional interactions (UC-4)	- construction of wells, methods of perforation and methods of development of oil and gas wells; - theoretical foundations of lifting water from wells; - the structure and flow regimes of gas-liquid flows in operating the columns and Elevator tubes of oil and gas wells.	- design a program for setting the well to the mode with the installed ESP.	- methods for technological calculation of well parameters during operation ESP.
the ability to develop scientific and technical, design and service documentation, draw up scientific and technical reports, reviews, publications, reviews. (PC-3)	- basic methods of mechanized lifting of fluid from wells; - basic design of the main types of deep-pumping and surface equipment of wells.	- demonstrate and correct technological processes during the operation of wells for various purposes; - apply and maintain technological equipment used in oil production.	- methods of designing and selecting equipment for the operation of wells by electric submersible pumping units.
the ability to find and process information required for decision-making in scientific research and in practical technical activities (OPC-5)	- well designs, perforation methods, and methods for developing oil and gas wells; - theoretical foundations for lifting fluids from wells; - structures and flow modes of gas-liquid flows in production	- design a program for putting the well into operation with the installed ESP.	- methods for technological calculation of well parameters during ESP operation.

	columns and lift pipes of oil and gas wells.		

4. Scope of the discipline and types of academic work

Table 3-Scope of the discipline and types of academic work
for full-time education

Type of academic work		Total, acc. hours	Module 1
Classroom activities		36	36
including:			
Lectures (L)			
Practical/seminar sessions (PZ)		36	36
Laboratory work (LR)			
Course project/course work			
Independent work (SRS), including control		36	36
Type of certification test			Set-off
Total labor	72	72	72
	2	2	2

5. Content of the discipline

Table 4-Content of discipliness and types of classes
for full-time and part-time education

n/a number	Name of the section of the discipline / topic of the lesson	Lecturehall.	Pract. / workshop.	Lab.	SRS	Just an hour.
	1 Module					
1.	**Section #1. Information and information technologies**		**12**		**6**	**18**
	Topic 1.1. Information and information resources.		4		2	6
	Topic 1.2. Information technologies and information systems of the oil and gas complex		4		2	6
2.	**Section #2. Selection of ESP for well**		4		2	6
	Topic 2.1. Classification of software. Basic software.		**12**		**6**	**18**
	Topic 2.2. Applied software and its development trends. Specialized software software		4		2	6
3.	**Section #3. Computer networks**		4		2	6
	Topic 3.1. Local computer networks. Global computer networks. Automated workplace		4		2	6
	Offset		**12**		**6**	**18**

6. Educational technologies

Organization of classes by discipline Information technologies in the oil and gas industry is conducted according to the following types of educational work: lectures, practical classes/ seminars.

Implementation of the competence-based approach within the framework of the training area 21.04.01 Oil and gas engineering / Technologies of oil and gas production and transportation provides for a combination of contact work with the teacher and extracurricular independent work of students in the educational process for a more complete formation and development of their professional skills.

Lectures are held in a live audience, including using a multimedia projector in the form of an educational presentation. The main points of the lecture sessions are outlined by students, individual topics (parts of topics and sections) are offered for self-study with the obligatory compilation of a summary (checked by the teacher during the current control).

The purpose of practical classes / seminars is for students to gain knowledge and develop practical skills in solving complex issues related to putting oil wells equipped with ESP into operation. To achieve these goals, both traditional forms of work are used – problem solving, working with technological and socialized materials and documents, while using interactive methods-group work, analysis of specific situations, business game, etc.

Group work when analyzing a specific situation, as well as when performing laboratory work in a subgroup, develops the ability to analyze and diagnose problems. Using the method of analyzing a specific situation, students develop such qualification qualities as the ability to clearly formulate and express their position, the ability to communicate, discuss, perceive and evaluate information received in verbal form. Practical classes are held in special classrooms equipped with the necessary visual materials.

Independent work is carried out in an individual format based on the teaching materials of the discipline (*appendices2-3*). The level of mastering the material on independently studied questions of the course is checked during the current control and certification tests (exam and/or credit).) by discipline.

7. Educational, methodological and informational support of the discipline

Basic literature:

1. Bolsunovskaya L. M. [et al.] Petroleum Engineering. Course book = Oil and gas Engineering. Book for students: a study guide/ edited by L. M. Bolsunovskaya, R.N. Abramova, I. A. Matveenko. - Electron. dan. Tomsk: TPU Publ., 2014, 742 p.
https://e.lanbook.com/book/62912

2. Tetelmin V. V. Neftegazovoe delo [Oil and gas Engineering]. Training manual / V. V.Tetelmin, V. A. Yazev. - 2nd ed.; Dolgoprudny: Publishing House "Intellect", 2014. - 800 p.
http://lib.rudn.ru

3. Tetelmin V. V. Osnovy bureniya na neft i gaz: Uchebnoe posobie [Fundamentals of drilling for oil and gas: A textbook]. Dolgoprudny: Intellekt, 3rd ed., 2014, 296 p.
http://znanium.com/catalog/product/478822

Additional literature:

1. Sayfullin I. Sh.,Tetelmin V. V., Yazev V. A. Fizicheskie osnovy dobycha nefti: Uchebnoe posobie [Physical fundamentals of oil production: A textbook]. Dolgoprudny:

Intellekt Publ., 2013, 328 p.
http://znanium.com/catalog/product/423812
2. Arbuzov V. N. Sbornik zadach po tekhnologii dobycheniya neftya i gaza v oslozhnennykh usloviyakh: praktikum: uchebnoe posobie [Collection of problems on oil and gas production technology in complicated conditions]. Arbuzov, E. V. Kurganova. - Electron. dan. Tomsk: TPU Publ., 2014, 68 p. (in Russian)
https://e.lanbook.com/book/82862

Periodicals:

1. Neftegazovaya Vertikal magazine http://ngv.ru
2. Gas Industry Magazine http://neftegas.info/gasindustry/
3. Magazines "Neftegaz.ru" http://www.neftegaz.ru

Resources of the Internet information and telecommunications network»:

1. RUDN University EBS and third-party EBS that university students have access to on the basis of concluded contracts:
-RUDN University Electronic Library System-RUDN University Electronic Library System http://lib.rudn.ru/MegaPro/Web
- EBS "University Library online" http://www.biblioclub.ru
- EBS Urite http://www.biblio-online.ru
- EBS "Student's consultant" www.studentlibrary.ru
- EBS "Lan" http://e.lanbook.com/

2. Websites of ministries, departments, services, industrial enterprises and companies whose activities are relevant for this discipline:
- Website of the Ministry of Energy of the Russian Federation https://minenergo.gov.ru
- Gazprom PJSC http://www.gazprom.ru
- PJSC LUKOIL http://www.lukoil.ru

3. Databases and search engines:
- electronic fund of legal and regulatory and technical documentation http://docs.cntd.ru/
- Yandex search engine https: / /www.yandex.ru/
- Google search engine https://www.google.ru/
- SCOPUS abstract database http://www.elsevierscience.ru/products/scopus/

Software:
1. Specialized software for conducting lectures, laboratory and practical classes and independent work of students:
- Specialized software "TransasShelf 6000 DrillingSimulator»
- License for ARMARIS software for TESP ESP

Methodological materials for students ' independent work and study of the discipline (also available in the corresponding section of the discipline in the TUIS RUDN University).):

1. Course of lectures on the discipline Software package for assessing the reliability of submersible equipment based on operational data (*Appendix 2*).

2. Guidelines for independent work of students in the disciplineTechnology of operation of oil and gas wells (*Appendix 3*).

3. Laboratory workshop on the disciplineSoftware package for assessing the reliability of submersible equipment based on operational data (*Appendix 4*).

8. Material and technical support of the discipline

Table 5-Material and technical support of the discipline

Audience with a list of material and technical support	**Location**
Classroom # 333. A set of specialized furniture; technical means: projection screen; NEC V302X multimedia projector; DEPO Neos 220	St system unit. Podolskoe Shosse, 8k. 5
Laboratory of Mining machines room No. 358. Computer with pre-installed licensed software "ARMARIS" Intel processor Soge15, 7 pcs; "Wellhead fittings" - mock-up stand; 3D LED TV on a stand with a screen diagonal of 32 inches; Mock-up controller "Electon-09 1" from SU "Electon 05-250 " in a compact design	Ul. Podolskoe Shosse, 8k. 5
Laboratory of Mining machines, room No. 362. Set of specialized furniture; Simulator-simulator of drilling "Transas SHELF 6000 Drill"; Additional place of the trainee to the simulator-simulator of drilling "Transas SHELF 6000 Drill"	Ul. Podolskoe Shosse, 8k. 5
Laboratory of Hydrodynamic processes of oil and gas production, room No. 341. Ejector; Working table of the stand, instrumentation and control valves; Tank; Stand-model of the pump-ejector system, left view; Laser diode; Liquid column; Air compressor; Gas supply system to the column; Gas meter; Pressure gauge; Photodiode; Digital oscilloscope.	Ul. Podolskoe Shosse, 8k. 5

9. Evaluation Funds Fund

Materials for assessing the level of mastering the educational material of the discipline(evaluation materials), including a list of competencies, specifying stages of their formation, description of the indicators, and criteria of assessment competencies at different stages of their formation, the description of the scales of assessment, typical assignments or other materials necessary for the evaluation of knowledge, skills, and (or) operational experience that characterize the stages' formation of competencies in the process of mastering the educational program, training materials, defining the procedure of assessment of the knowledge, skills, proficiency and (or) operational experience that characterize the stages of competence formation have been developed in full and are available to students, on the discipline page, on the website of the RUDN University (TUIS RUDN).

The program is designed in accordance with the requirements of the RUDN University OS.

Developer:

Professor of the Department of Subsurface Use and Oil and Gas Engineering		A.N. Drozdov
position	signature	initials, surname
Senior lecturer of the Department of Subsurface Use and Oil and Gas Engineering		D.A. Drozdov
position	signature	initials, surname

Program Manager

Professor of the Department of Subsurface Use and Oil and Gas Engineering		V.M. Kapustin
position	signature	initials, surname

Director of the Department of Subsurface Use and Oil and Gas Engineering		A.E. Kotelnikov
position	signature	initials, surname

Federal State Autonomous Educational Institution
of Higher Education
«Peoples ' Friendship University of Russia»

Engineering Academy

WORKING PROGRAM OF THE DISCIPLINE

Name of the discipline: Oil production intellectualization

Training area: 21.04.01 Oil and gas engineering

Program (focus (profile)): Oil and gas production and transportation technologies

1. Purpose and objectives of the discipline

The purpose of mastering the discipline Oil production intellectualization is the acquisition by students of theoretical knowledge and practical skills in solving complex issues related to the use of software and equipment for well operation and efficient field development. Training students in identifying problems and selecting intellectual and technical developments for 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 field development in general.

The main **objectives** of the discipline are:
- study of techniques and identification of problems in field development and well operation;
- study of existing intellectual Russian and foreign developments;
- acquisition of skills in choosing a particular equipment;
- mastering the methodology for calculating equipment characteristics.

2. Place of the discipline in the structure of the educational program

Discipline Oil production intellectualization belongs to the variable part of Block 1 of the curriculum. Its study is based on the material of previous disciplines, and it is also basic for studying subsequent disciplines of the curriculum, the list of which is presented in Table 1.

Table 1-List of previous and subsequent disciplines

n/a number	Previous disciplines	Subsequent disciplines
1	Dual completion of well for production	State final certification
2	Reservoir pressure maintenance systems using multi-stage vane pumps	
3	Software package for assessing the reliability of submersible equipment based on operational data	
4	Universal method of selecting submersible vane pump installations for oil	
5	Submersible vane pump installations for oil	
6	Methods for improving the ESP resource	

3. List of planned results of training in the discipline, correlated with the planned results of mastering the educational program

Discipline Oil production intellectualization is aimed at developing the following competencies in students:

- is able to assess the prospects and opportunities for using the achievements of scientific and technological progress in the innovative development of the industry, and suggest ways to implement them (PC-1);

- is able to use the methodology of scientific research in professional activities (PC-2).

The result of training in the discipline is knowledge, skills, abilities and (or) experience of activity that characterize the stages of competence formation and ensure the achievement of the planned results of mastering the educational program, presented in Table 3.

Table 3-Results of training in the discipline, correlated with the planned results of mastering the OPOP in higher education

Competence	**of Knowledge**	**Skills**	**Skills**
1	2	3	4
ability to assess the prospects and possibilities of using the achievements of scientific and technical progress in the innovative development of the industry, and to suggest ways of their implementation (PC-1)	- design of wells, methods of perforation and methods of development of oil and gas wells; - theoretical foundations of lifting water from wells; - the structure and flow regimes of gas-liquid flows in operating the columns and Elevator tubes of oil and gas wells.	- design a program for setting the well to the mode with the installed ESP.	- methods for technological calculation of well parameters during operation ESP.
the ability to use the methodology of scientific research in their professional activities (PC-2)	- the main methods of mechanized lifting water from wells; the fundamental design of the main types of deep-well pumping and surface equipment of wells.	- to demonstrate and to adjust processes in the operation of wells for various purposes; - to apply, and maintain technology equipment used in the extraction of oil.	- methods of designing and selecting equipment for the operation of wells by electric submersible pumping units.

4. Scope of the discipline and types of academic work

Table 3-Scope of the discipline and types of academic work

for fullo-time education

Type of academic work	Total,	Module

		acc. hours	5
Classroom activities		36	36
including:			
Lectures (L)		9	9
Practical/seminar sessions (PZ)		27	27
Laboratory work (LR)			
Course project/course work			
Independent work (SRS), including control		72	72
Type of certification test			Set-off
Total labor	intensity hour	108	108
	credits	3	3

5. Content of the discipline

Table 4-Content of discipliness and types of classes
for full-time education

n/a number	Name of the section of the discipline / topic of the class	Lectures.	Pract. / workshop.	Lab.	SRS	Just an hour.
	5 MODULE					
1.	**Section #1. General information about smart wells**	**4**	**10**		**12**	
	Topic 1.1. The concept of an intelligent well. Basic elements and operating principle of an intelligent well.	2	4		6	
	Topic 1.2. Examples of well intellectualization for oil production.	2	4		6	
2.	**Section #2. Intelligent automation systems in technological operations for oil and gas production.**	**2**	**10**		**22**	
	Topic 2.1. Technical solutions of an intelligent control system for mechanized oil production . Inflow monitoring devices.	1	4		10	
	Topic 2.2. Intelligent well production management system Manara (Schlumberger). Intelligent finishing system WellWatcher FLUX (Schlumberger).	1	6		12	
3.	**Section #3. Examples of implementing smart technologies**	**3**	**7**		**20**	
	Topic 3.1. Intellectual developments and their implementation in the fields of Russia	1	2		5	
	Topic 3.2. Foreign experience in implementing intellectual developments.	1	2		9	
	Topic 3.3. Prospects for the development of high-tech "smart" deposits in Russia and abroad.	1	3		6	
	Credit				**18**	**18**

6. Educational technologies

Organization of classes by discipline Oil production intellectualization is carried out in the following types of educational work: lectures, practical exercises/ seminars.

Implementation of the competence-based approach within the framework of the training 21.04.01 Oil and gas engineering / Technologies of oil and gas production and transportation provides for a combination of contact work with the teacher and extracurricular independent work of students in the educational process for a more complete formation and development of their professional skills.

Lectures are held in a live audience, including using a multimedia projector in the form of an educational presentation. The main points of the lecture sessions are outlined by students, individual topics (parts of topics and sections) are offered for self-study with the obligatory compilation of a summary (checked by the teacher during the current control).

The purpose of practical classes / seminars is for students to gain knowledge and develop practical skills in solving complex issues related to putting oil wells equipped with ESP into operation. To achieve these goals, both traditional forms of work are used – problem solving, working with technological and socialized materials and documents, while using interactive methods group work, analysis of specific situations, business game, etc.

Group work when analyzing a specific situation, as well as when performing laboratory work in a subgroup, develops the ability to analyze and diagnose problems. Using the method of analyzing a specific situation, students develop such qualification qualities as the ability to clearly formulate and express their position, the ability to communicate, discuss, perceive and evaluate information received in verbal form. Practical classes are held in special classrooms equipped with the necessary visual materials.

Independent work is carried out in an individual format based on the teaching materials of the discipline (*appendices2-5*). The level of mastering the material on independently studied questions of the course is checked during the current control and certification tests (exam and/or credit).) by discipline.

7. Educational, methodological and informational support of the discipline

Basic literature:

1. Bolsunovskaya L. M. [et al.] Petroleum Engineering. Course book = Oil and gas Engineering. Book for students: a study guide/ edited by L. M. Bolsunovskaya, R. N. Abramova, and I. A. Matveenko. - Electron. dan. Tomsk: TPU Publ., 2014, 742 p.
https://e.lanbook.com/book/62912

2. Tetelmin V. V. Neftegazovoe delo [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. Osnovy bureniya na neft i gaz: Uchebnoe posobie [Fundamentals of drilling for oil and gas: A textbook]. Dolgoprudny: Intellekt, 3rd ed., 2014, 296 p.
http://znanium.com/catalog/product/478822

Additional literature:

1. Sayfullin I. Sh., Tetelmin V. V., Yazev V. A. Fizicheskie osnovy dobycha

nefti: Uchebnoe posobie [Physical fundamentals of oil production: A textbook]. Dolgoprudny: Intellekt Publ., 2013, 328 p.
http://znanium.com/catalog/product/423812
2. Arbuzov V. N., Kurganova E. V. Sbornik zadach po tekhnologii dobycheniya neftya i gaza v oslozhnennykh usloviyakh: praktikum: uchebnoe posobie [Collection of problems on oil and gas production technology in complicated conditions]. - Electron. dan. Tomsk: TPU Publ., 2014, 68 p. (in Russian)
https://e.lanbook.com/book/82862

Periodicals:

1. Neftegazovaya Vertikal magazine http://ngv.ru
2. Gas Industry Magazine http://neftegas.info/gasindustry/
3. Magazines "Neftegaz.ru" http://www.neftegaz.ru

Resources of the Internet information and telecommunications network»:

1. RUDN University EBS and third-party EBS that university students have access to on the basis of concluded contracts:
-RUDN University Electronic Library System-RUDN University Electronic Library System http://lib.rudn.ru/MegaPro/Web
- EBS "University Library online" http://www.biblioclub.ru
- EBS Urite http://www.biblio-online.ru
- EBS "Student's consultant" www.studentlibrary.ru
- EBS "Lan" http://e.lanbook.com/

2. Websites of ministries, departments, services, industrial enterprises and companies whose activities are relevant for this discipline:
- Website of the Ministry of Energy of the Russian Federation https://minenergo.gov.ru
- Gazprom PJSC http://www.gazprom.ru
- PJSC LUKOIL http://www.lukoil.ru

3. Databases and search engines:
- electronic fund of legal and regulatory and technical documentation http://docs.cntd.ru/
- Yandex search engine https: / /www.yandex.ru/
- Google search engine https://www.google.ru/
- SCOPUS abstract database http://www.elsevierscience.ru/products/scopus/

Software:
1. Specialized software for conducting lectures, laboratory and practical classes and independent work of students:
- Specialized software " TransasShelf 6000 DrillingSimulator»
- License for ARMARIS software for TESP ESP

Methodological materials for students ' independent work and study of the discipline (also available in the corresponding section of the discipline in the TUIS RUDN University).):

1. Course of lectures on the discipline Oil production intellectualization (*Appendix 2*).

2. Guidelines for independent work of students in the discipline Oil production intellectualization (*Appendix 3*).

8. Material and technical support of the discipline

Table 5-Material and technical support of the discipline

Audience with a list of material and technical support	**Location**
Classroom # 333. A set of specialized furniture; technical means: projection screen; NEC V302X multimedia projector; DEPO Neos 220	St system unit. Podolskoe Shosse, 8k. 5
Laboratory mining machines AUD. No. 358. Computer with pre-installed licensed software "of ARMARIS" Intel Core i-5, 7 PCs; "Wellhead valves" layout-stand; 3D LED TV at the front with a screen diagonal of 32 inches; Layout - controller "ELEKTON-09 1" from SU "ELEKTON 05-250" in a compact design	Ul. Podolskoe Shosse, 8k. 5
Laboratory of Mining machines, room No. 362. Set of specialized furniture; Simulator-simulator of drilling "Transas SHELF 6000 Drill"; Additional place of the trainee to the simulator-simulator of drilling "Transas SHELF 6000 Drill"	Ul. Podolskoe Shosse, 8k. 5
Laboratory of Hydrodynamic processes of oil and gas production, room No. 341. Ejector; Working table of the stand, instrumentation and control valves; Tank; Stand-model of the pump-ejector system, left view; Laser diode; Liquid column; Air compressor; Gas supply system to the column; Gas meter; Pressure gauge; Photodiode; Digital oscilloscope.	Ul. Podolskoe Shosse, 8k. 5

9. Evaluation Funds Fund

Materials for assessing the level of mastering the educational material of the discipline(evaluation materials), including a list of competencies, specifying stages of their formation, description of the indicators, and criteria of assessment competencies at different stages of their formation, the description of the scales of assessment, typical assignments or other materials necessary for the evaluation of knowledge, skills, and (or) operational experience that characterize the stages' formation of competencies in the process of mastering the educational program, training materials, defining the procedure of assessment of the knowledge, skills, proficiency and (or) operational experience that characterize the stages of competence formation have been developed in full and are available to students, on the discipline page, on the website of the RUDN University (TUIS RUDN).

The program is designed in accordance with the requirements of the RUDN University OS.

Developer:

Professor of the Department of Subsurface Use and Oil and Gas Engineering		A.N. Drozdov
position	signature	initials, surname
Teaching assistant of the Department of Subsurface Use and Oil and Gas Engineering		Ya.A. Gorbyleva
position	signature	initials, surname

Program Manager

Professor of the Department of Subsurface Use and Oil and Gas Engineering		V.M. Kapustin
position	signature	initials, surname

Director of the Department of Subsurface Use and Oil and Gas Engineering		A.E. Kotelnikov
position	signature	initials, surname

Federal State Autonomous Educational Institution
of Higher Education
«Peoples ' Friendship University of Russia»

Engineering Academy

WORKING PROGRAM OF THE DISCIPLINE

Name of the discipline: History and methodology of subsoil use

Training area: 21.04.01 Oil and gas engineering

Program (focus (profile)): Oil and gas production and transportation technologies

1. Purpose and objectives of the discipline:

The purpose of mastering the discipline "History and methodology of subsoil use" is intended to introduce students to the theoreticaland applied foundations of subsurface use in Russia and abroad.

Study of the discipline "History and methodology of subsoil use" provides for the formation of knowledge about the basic principles, subject matter, method and history of mining; the legal status and powers of subjects of the geological industry, the structure and content of legal relations in the field of subsurface use, legislative and bylaws regulating relations related to the use of subsurface resources, law enforcement of international treaties and agreements.

2. The place of the discipline in the structure of the OP HE:

Discipline "History and methodology of subsoil use" refers to The basic component of the Mandatory part of Block 1 of the curriculum.

Table 1 shows the previous and subsequent disciplines aimed at the formation of discipline competencies in accordance with the matrix of competencies of the Higher Professional Education Department.

Table 1

Previous and subsequent disciplines aimed at:
on the formation of competencies

n	a Code and name of the competence	Previous disciplines	Subsequent disciplines
Competencies			
UC-6. Able to determine and implement priorities of their own activities and ways to improve them based on self-assessment OPC-5. It is able to evaluate the results of scientific and technical developments, scientific research and justify its own choice, systematizing and summarizing achievements in the oil and gas industry and related fields		Disciplines of the previous level of education	Research work (obtaining primary skills in research work) Research work State final certification

3. Requirements for the results of mastering the discipline:

The process of studying the discipline "History and methodology of subsoil use" is aimed at developing the following competencies::

Table 2

Emerging competencies

Competencies	Name of the competence	Indicators of achievement of competence achievement
UC-6	Able to define and implement the priorities of their own activities and ways of its improvement through self-evaluation	Know their resources and their limits (personal, situational, temporary, etc.) to successfully perform the assigned work; the basics of planning long-term goals of their own activities subject to the conditions, tools, and personal opportunities, stages of career development, temporary prospects of development activities and requirements of the labour market Must implement the intended goals of the activity, taking into account the conditions, means, personal opportunities, stages of career growth, time prospects for the development of activities and labor market requirements; critically evaluate the effectiveness of using time and other resources in solving the tasks set, as well as regarding the result obtained

		Has the skills to determine an effective course of action in the field of professional activity; decision-making at the level of their own professional activity; planning skills of their own professional activity
PC-5	It is able to evaluate the results of scientific and technical developments, scientific research and justify its own choice, systematizing and summarizing achievements in the oil and gas industry and related fields	Knows the range of modern technology processes and productions in the field of oil and gas business; modern innovations and the research carried out at the present stage; methods and principles of systematization and generalization of the results of achievements in the oil and gas industry and related fields; the core technologies of prospecting, exploration and organization of the oil and gas production in Russia and abroad, standards and specifications, sources of information, mass media and multimedia technologies Can consciously perceive information, independently search, extract, systematize, analyze and select information necessary for solving problems, organize, transform, save and transmit it; interpret the results of laboratory and technological research in relation to specific conditions Proficient in methods of collecting, processing and interpreting received information, using modern information technologies and applied hardware and software tools, methods of protecting, storing and submitting information

4. Scope of the discipline and types of academic work:

The total labor intensity of the discipline is **3 credit units (108 hours).**

Type of academic work	**Total hours**	**Module**
		1
Classroom sessions (total)	**36**	36
Including:		
Lectures	**18**	18
Practical exercises (PZ)	**18**	18
Seminars (C)	**-**	-
Laboratory work (LR)	**-**	-
Independent work (total)	**72**	72
Control	**-**	-
Total labor intensity hour	**108**	108
creditunits	**3**	3

5. Content of the discipline

5.1. Content of the discipline sections

n/a number	**Name of the section (topic) of the discipline**	**Section content (topics)**

1.	Mining history	Introduction to the history of the origin and development of the art and skills of mining by people from the moment of their origin to the present day, as well as the progressive change in technology and technology.
2.	History of the oil and gas industry development	The importance of energy resources for the country. Fuel and energy complex in the structure of the economy of the USSR and Russia. General overview of the Russian oil and gas industry.
3.	History of oil and gas transportation and storage	History of the development of methods of transportation and storage of oil and petroleum products. History of pipeline transport.
4.	History of development of major oil and gas fields	The main fields and indicators of oil and gas production in Russia.
5.	Subsurface use methodology	The essence and feature of the methodology. Evolution of approaches to the study of subsurface use. The place of scientific knowledge about subsurface use in the classification of sciences. Levels of scientific knowledge of subsurface use

5.2. Sections of disciplines and types of classes (full-time education)

	Name of the discipline section	**Lecturehall .**	**Prakt. zan.**	**Lab. zan.**	**Semin**	**SRS**	**Just an hour.**
1 module							
1.	Mining history	2	2	-	-	14	18
2.	History of the oil and gas industry development	4	4	-	-	14	32
3.	History of oil and gas transportation and storage	4	4	-	-	16	22
4.	History of development of major oil and gas	fields 4	4	-	-	14	18
5.	Subsurface use methodology	4	4	-	-	14	
	Test						

6. A laboratory workshop is not provided.

7. Practical exercises (seminars)

n/	**a number of the section (topic) of the discipline**	**Topics ofpractical classes**	**Laborcapacity (hour.) OFO**
1.	1.	Subsurface resources as a subsurface use object	2
2.	2.	Founders of mining sciences	4
3.	3.	Scientists and industrialists who contributed to the treasure in the formation of mining and oil business	4
4.	4.	D. I. Mendeleev and the development of oil business in Russia	4
5.	5.	Periodization of the history of mining relations and mining law in Russia	4
	Total		**18**

8. Material and technical support of the discipline:

Audience with a list of material and technical support	**Location**

Classroom for conducting lecture-type classes: room 335 Set of specialized furniture; technical means: projection screen; SANYO PROxtraX multimedia projector; DEPO Neos system unit 220	Ul. Podolskoe Shosse, 8k. 5
Training room for conducting seminar-type classes: room No. 356 Set of specialized furniture; chalkboard; NEC PLASMA monitor MONITO MODEL PX-42XM1G; system unit DEPO Neos 220	Ul. Podolskoe Shosse, 8k. 5
Training room for conducting seminar-type classes: laboratory of mining machines, room No. 362 Set of specialized furniture; Simulator-simulator of drilling "Transas SHELF 6000 Drill"; Additional place of the trainee to the simulator-simulator of drilling "Transas SHELF 6000 Drill"	Ul. Podolskoe Shosse, 8k. 5

9. Information support of the discipline:

The implementation of the educational process in the discipline is based on the use of the following information technologies::

1. RUDN University EBS and third-party EBS that university students have access to on the basis of concluded contracts:

-RUDN University Electronic Library System-RUDN University Electronic Library System http://lib.rudn.ru/MegaPro/Web

- EBS "University Library online" http://www.biblioclub.ru
- EBS Urite http://www.biblio-online.ru
- EBS "Student's consultant" www.studentlibrary.ru
- EBS "Lan" http://e.lanbook.com/

2. Websites of ministries, departments, services, industrial enterprises and companies whose activities are relevant for this discipline:

- Website of the Ministry of Energy of the Russian Federation https://minenergo.gov.ru
- Gazprom PJSC http://www.gazprom.ru
- PJSC LUKOIL http://www.lukoil.ru

3. Databases and search engines:

- electronic fund of legal and regulatory and technical documentation http://docs.cntd.ru/
- Yandex search engine https: / /www.yandex.ru/
- Google search engine https://www.google.ru/
- SCOPUS abstract database http://www.elsevierscience.ru/products/scopus/

10. Educational, methodological and informational support of the discipline:

Basic literature:

1. Vorob'ev A. E., Sinchenko A.V. Istoriya neftegazovogo dela v Rossii i za rubezhom [History of oil and gas engineering in Russia and abroad]. text data, Moscow: Peoples ' Friendship University of Russia, 2013, 140 p.

2. Karpov V. P. Course of history of the domestic oil and gas industry : training manual. [Electronic resource]: textbook. manual / V. P. Karpov, N. Yu. Gavrilova. - Electron. dan. — Tyumen : TyuMGNUPubl., 2011, 254 p. (in Russian) —

3. Ahrens, V. J. Fundamentals of mining science methodology : training manual / V. Zh.Arens, Moscow : Moscow State Mining University, 2003, 226 p. [Electronic resource]. - URL: //biblioclub.ru/index.php?page=book&id=79370

4. Kutuzov B. N. Istoriya gornogo i vzryvnogo dela : uchebnik [History of mining and blasting]. - Moscow : Moscow State Mining University, 2008, 428 p. [Electronic resource]. - URL: //biblioclub.ru/index.php?page=book&id=99658

Additional literature:

1. Sergeeva Z. Kh. Uglevodnaya tsivilizatsiya mezhdu proshlem i budushchem [Hydrocarbon civilization between the past and the future]: neft i razvitie v XX-XXI vv [Oil and development in the XX-XXI centuries]. — Kazan : Kazan National Research Technological University, 2012. — 196 p. (in Russian)
2. Oil and gas industry of Russia: Textbook / Yu. D. Zemenkov et al. - Omsk: OmSTU PublishingHouse, 2001. - 84 p.
3. Mstislavskaya L. P. Neftegazovoe proizvodstvo (Voprosy, problemy, resheniya): Uchebnoe posobie [Oil and gas production (Voprosy, problemy, resheniya)].
4. Kopytov A. I., Yu. A. Istoriya gornogo dela [History of mining].Masaev, V. V. Pershin. Edited by V. V. Pershin; Akadem. gorn. nauk, Sib. Novosibirsk, 2009, 511 p. (in Russian)
5. Mining industry of Russia-USSR in the first quarter of the XX century: A textbook for universities / E. M. Sukhanova. - Moscow : Mining Book; MGSU Publishing House, 2009. - 600 p. - (History of Mining, Vol. 1).

Online resources:

http:// www.rmpi.ru
http://mining-media.ru
http://geomar.ru/articles/pmpk.html
http://kopimash.ru
http://yumz.ru/
http://www.ugolinfo.ru/
http://www.complexdoc.ru/
http://miningwiki.ru -mining encyclopedia
http://mining-enc.ru -mountain encyclopedia
http:// spelesto.ucoz.ru -articles about the history of mining
http://www.idsas.ru/ http://moregost.ru/

11. Guidelines for students on mastering the discipline (module):

Independent work of students is carried out on the instructions of the teacher, without his direct participation. Independent work of students should be systematic.

Working in practical classes involves the active participation of students. During practical classes, the student is also recommended to take notes on the main content of the course. When teaching a discipline, it is methodically advisable to highlight the most important points in each section of the course and focus students ' attention on them.

In the course of mastering the discipline, as part of independent work, the student: works with literature in the RUDN University library; uses electronic library resources, resources of the information and communication network "Internet".

Features of implementation of the discipline for disabled people and persons with disabilities.

Training in the discipline of disabled people and persons with disabilities (hereinafter referred to as HIA) is carried out by the teacher, taking into account the peculiarities of psychophysical development, individual capabilities and health status of such students.

For students with musculoskeletal disorders and hearing disabilities, lectures and practical classes are accompanied by multimedia tools and handouts.

For students with visual disabilities, it provides for the use of technical means to enhance residual vision, as well as the possibility of developing audio materials.

In this discipline, training of disabled people and persons with disabilities can be carried out both in the classroom and remotely using the capabilities of the electronic educational environment (Training Portal) and e-mail.

Training of disabled people and persons with disabilities can be carried out according to an approved individual schedule, taking into account the peculiarities of their psychophysical development and health status, which implies individualization of the content, methods, pace of learning activities of the student, the ability to monitor specific actions of the student when solving specific tasks, making, if necessary, the required adjustments to the learning process.

It provides for individual consultations (including consultation via e-mail), provision of additional educational

and methodological materials (depending on the diagnosis).

12. Fund of assessment funds for conducting intermediate certification of students in the discipline (module):

Materials for assessing the level of mastering the educational material of the discipline(evaluation materials), including a list of competencies, specifying stages of their formation, description of the indicators, and criteria of assessment competencies at different stages of their formation, the description of the scales of assessment, typical assignments or other materials necessary for the evaluation of knowledge, skills, and (or) operational experience that characterize the stages' formation of competencies in the process of mastering the educational program, training materials, defining the procedure of assessment of the knowledge, skills, proficiency and (or) operational experience that characterize the stages of competence formation have been developed in full and are available to students, on the discipline page, on the website of the RUDN University (TUIS RUDN).

The program is designed in accordance with the requirements of the RUDN University OS.

Developer:

Associate Professor of the Department of Subsurface Use and Oil and Gas Affairs		T.V. Chekushina
position	signature	initials, surname

Program Manager

Professor of the Department of Subsurface Use and Oil and Gas Engineering		V.M. Kapustin
position	signature	initials, surname

Director of the Department of Subsurface Use and Oil and Gas Engineering		A.E. Kotelnikov
position	signature	initials, surname

Federal State Autonomous Educational Institution
of Higher Education
«Peoples ' Friendship University of Russia»

Engineering Academy

WORKING PROGRAM OF THE DISCIPLINE

Name of the discipline: Small-sized ESP for sidetracks

Training area: 21.04.01 Oil and gas engineering

Program (focus (profile)): Oil and gas production and transportation technologies

1. Purpose and objectives of the discipline

The purpose of mastering the discipline Small-sized ESP for sidetracks is the acquisition of students ' theoretical knowledge and practical skills in solving complex issues related to the use of equipment in the side shafts of producing wells. Training students in various methods of extraction from wells with limited overall dimensions, as well as the selection of this equipment. General information about examples of implementation of small-sized submersible pumping units. Influence of free gas on the characteristics of submersible centrifugal pumps.

The main **objectives** of the discipline are:
- study of equipment schemes used in the operation of wells with pumping equipment;
- study of equipment performance characteristics,
- acquisition of skills in choosing a particular equipment;
- mastering the method of selection - wells with a side shaft for installing a small-sized ESP.

2. Place of the discipline in the structure of the educational program

Discipline Small-sized ESP for sidetracks refers to the variable part of Block 1 of the curriculum. Its study is based on the material of previous disciplines, and it is also basic for studying subsequent disciplines of the curriculum, the list of which is presented in Table 1.

Table 1-List of previous and subsequent disciplines

n/a number	Previous disciplines	Subsequent disciplines
1	Simultaneously-separate operation of wells	State final certification
2	Reservoir pressure maintenance systems using multi-stage vane pumps	
3	Technology and techniques of water and gas impact on the reservoir	
4	Submersible vane pump installations for oil	
5	Software package for assessing the reliability of submersible equipment based on operational data	
6	Universal method of selecting submersible vane pump installations for oil	
7	Methods for improving the ESP resource	
8	Output of wells equipped with ESP to mode	
9	Intellectualization of oil production	

3. List of planned results of training in the discipline, correlated with the planned results of mastering the educational program

Discipline Small-sized ESP for sidetracks is aimed at developing the following competencies in students:

- with the ability to analyze and summarize data on the operation of technological equipment, monitor, provide technical support and manage technological processes in the oil and gas industry (PC-2);

-it is responsible for ensuring safe and efficient operation and operation of technological equipment in the oil and gas industry (PC-3).

The result of training in the discipline is knowledge, skills, abilities and (or) experience of activity that characterize the stages of competence formation and ensure the achievement of the planned results of mastering the educational program, presented in Table 3.

Table 3-Results of training in the discipline, correlated with the planned results of mastering the OPOP in higher education

Competence	**of Knowledge**	**Skills**	**Skills**
1	2	3	4
Ability to analyze and summarize data on the operation of technological equipment, monitor, provide technical support and manage technological processes in the oil and gas industry (PC-2)	- well designs, perforation methods, and methods for developing oil and gas wells; - theoretical foundations for lifting fluids from wells; - structures and flow regimes of gas-liquid flows in the pipes of oil and gas wells.	- design well structures, drill string layouts.	- methods of technological calculation of well parameters during pumping operation
Ability to ensure safe and efficient operation and operation of technological equipment in the oil and gas industry (PC-3)	- basic methods of mechanized lifting of fluid from wells; - basic design of the main types of deep-pumping and ground equipment of wells.	- demonstrate and correct technological processes during the operation of wells for various purposes; - apply and maintain technological equipment used in oil production, as well as in the collection and preparation of well products.	- methods of designing and selecting equipment for the operation of wells by submersible pumping units for oil production.

4. Scope of the discipline and types of academic work

Table 3-Scope of the discipline and types of academic work
for fulltime education

Type of academic work	Total, acc. hours	Module	
		6	7
Classroom activities	48	24	24

including:				
Lectures (L)		16	8	8
Practical/seminar sessions (PZ)		16	8	8
Laboratory work (LR)		16	8	8
Course project/course work				
Independent work (SRS), including control		132	84	48
Type of certification test				The exam
Total labor	intensity of academic hours	180	108	72
	credits	5	3	2

5. Content of the discipline

Table 4-Content of discipliness and types of classes
for fulltime education

n/a number	Name of the section of the discipline / topic of the class	Lectures.	Pract. / workshop.	Lab.	SRS	Just an hour.
	6 MODULE					
1.	**Section #1. Existing methods of operating oil wells with side shafts**	**4**	**4**	**4**	**35**	
	Topic 1.1. Overview of existing methods for operating oil wells with small diameter side shafts	2	2	2	20	
	Topic 1.2. The main problems in the operation of wells with side shafts.	2	2	2	15	
2.	**Section #2. Design features of ESP for operation of side wells of small wells**	**4**	**4**	**4**	**31**	
	Topic 2.1. Design features of small-sized ECN installations.	2	2	2	16	
	Topic 2.2. Analysis of the operation of small (2A, 3) and conventional centrifugal pumps, including centrifugal pumps with a retaining section	2	2	2	15	
	Credit				18	18
	7 MODULE					
3.	**Section #3. Operation of lateral boreholes using ESP with flexible intersectional connections**	**8**	**8**	**8**	**30**	
	Topic 3.1. Results of field tests and industrial application of a flexible coupling as part of the ESP.	4	4	4	15	
	Topic 3.2. Field research and use of small size installations (2A and 3)	4	4	4	15	
	Exam				**18**	**18**

6. Educational technologies

Organization of classes by discipline Small-sized ESP for sidetracks is carried out according to the following types of educational work: lectures, laboratory work, practical exercises.

Implementation of the competency-based approach within the framework of the training area 21.04.01 Oil and gas engineering / Technologies of oil and gas production and transportation provides for a combination of contact work with the teacher and extra-curricular independent work of students in the educational process for a more complete formation and development of their professional skills.

Lectures are held in a live audience, including using a multimedia projector in the form of an educational presentation. The main points of the lecture sessions are outlined by students, individual topics (parts of topics and sections) are offered for self-study with the obligatory compilation of a summary (checked by the teacher during the current control).

The purpose of practical classes is for students to gain knowledge and develop practical skills in solving complex issues related to the operation of wells with side shafts by submersible pumping units. To achieve these goals, both traditional forms of work are used – problem solving, working with technological equipment/specialized software when performing laboratory work, etc., and interactive methods – group work, analysis of specific situations, business game, etc.

Group work when analyzing a specific situation, as well as when performing laboratory work in a subgroup, develops the ability to analyze and diagnose problems. Using the method of analyzing a specific situation, students develop such qualification qualities as the ability to clearly formulate and express their position, the ability to communicate, discuss, perceive and evaluate information received in verbal form. Practical classes are held in special classrooms equipped with the necessary visual materials.

Independent work involves students working out individual questions of the theoretical course and preparing a presentation for the report.

Independent work is carried out in an individual format based on the teaching materials of the discipline (*appendices2-4*). The level of mastering the material on independently studied questions of the course is checked during the current control and certification tests (exam and/or credit).) by discipline.

7. Educational, methodological and informational support of the discipline

Basic literature:

1. Drozdov A. N., Drozdov N. A. Tekhnologiya vodogazovogo vozdeystviya na plast dlya povysheniya nefteotdacha : uchebnoe posobie [Technology of water and gas impact on the reservoir to enhance oil recovery]. - Electronic text data. - Moscow: RUDN Publishing House, 2019. - 160 p.: ill. - ISBN 978-5-209-09638-2 : 456.56.

http://lib.rudn.ru

2. Bolsunovskaya L. M. [et al.] Petroleum Engineering. Course book = Oil and gas engineering. Book for students: a study guide/ edited by L. M. Bolsunovskaya, R. N. Abramova, and I. A. Matveenko. - Electron. dan. Tomsk: TPU Publ., 2014, 742 p.

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

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

http://lib.rudn.ru

Additional literature:

1. Sayfullin I. Sh., Tetelmin V. V., Yazev V. A. Fizicheskie osnovy dobycha

nefti: Uchebnoe posobie [Physical fundamentals of oil production: A textbook]. Dolgoprudny: Intellekt Publ., 2013, 328 p.
http://znanium.com/catalog/product/423812
2. Arbuzov V. N., Kurganova E. V. Sbornik zadach po tekhnologii dobycheniya neftya i gaza v oslozhnennykh usloviyakh: praktikum: uchebnoe posobie [Collection of problems on oil and gas production technology in complicated conditions]. - Electron. dan. Tomsk: TPU Publ., 2014, 68 p. (in Russian)
https://e.lanbook.com/book/82862

Periodicals:

1. Neftegazovaya Vertikal magazine http://ngv.ru
2. Gas Industry Magazine http://neftegas.info/gasindustry/
3. Magazines "Neftegaz.ru" http://www.neftegaz.ru

Resources of the Internet information and telecommunications network»:

1. RUDN University EBS and third-party EBS that university students have access to on the basis of concluded contracts:
-RUDN University Electronic Library System-RUDN University Electronic Library System http://lib.rudn.ru/MegaPro/Web
- EBS "University Library online" http://www.biblioclub.ru
- EBS Urite http://www.biblio-online.ru
- EBS "Student's consultant" www.studentlibrary.ru
- EBS "Lan" http://e.lanbook.com/

2. Websites of ministries, departments, services, industrial enterprises and companies whose activities are relevant for this discipline:
- Website of the Ministry of Energy of the Russian Federation https://minenergo.gov.ru
- Gazprom PJSC http://www.gazprom.ru
- PJSC LUKOIL http://www.lukoil.ru

3. Databases and search engines:
- electronic fund of legal and regulatory and technical documentation http://docs.cntd.ru/
- Yandex search engine https: / /www.yandex.ru/
- Google search engine https://www.google.ru/
- SCOPUS abstract database http://www.elsevierscience.ru/products/scopus/

Software:
1. Specialized software for conducting lectures, laboratory and practical classes and independent work of students:
- Specialized software " TransasShelf 6000 DrillingSimulator»
- License for ARMARIS software for TESP ESP

Methodological materials for students ' independent work and study of the discipline (also available in the corresponding section of the discipline in the TUIS RUDN University).):

1. Course of lectures on the discipline Small-sized ESP for sidetracks (*Appendix 2*).
2. Guidelines for independent work of students in the discipline Small-sized ESP for sidetracks (*Appendix 3*).
3. Laboratory workshop on the discipline Small-sized ESP for sidetracks (*Appendix 4*).

8. Material and technical support of the discipline

Table 5-Material and technical support of the discipline

Audience with a list of material and technical support	**Location**
Classroom # 333. A set of specialized furniture; technical means: projection screen; NEC V302X multimedia projector; DEPO Neos 220	St system unit. Podolskoe Shosse, 8k. 5
Laboratory mining machines AUD. No. 358. Computer with pre-installed licensed software "of ARMARIS" Intel Core15, 7 PCs; "Wellhead valves" layout-stand; 3D LED TV at the front with a screen diagonal of 32 inches; Layout - controller "ELEKTON-09 1" from SU "ELEKTON 05-250" in a compact design	Ul. Podolskoe Shosse, 8k. 5
Laboratory of Mining machines, room No. 362. Set of specialized furniture; Simulator-simulator of drilling "Transas SHELF 6000 Drill"; Additional place of the trainee to the simulator-simulator of drilling "Transas SHELF 6000 Drill"	Ul. Podolskoe Shosse, 8k. 5
Laboratory of Hydrodynamic processes of oil and gas production, room No. 341. Ejector; Working table of the stand, instrumentation and control valves; Tank; Stand-model of the pump-ejector system, left view; Laser diode; Liquid column; Air compressor; Gas supply system to the column; Gas meter; Pressure gauge; Photodiode; Digital oscilloscope.	Ul. Podolskoe Shosse, 8k. 5

9. Evaluation Funds Fund

Materials for assessing the level of mastering the educational material of the discipline(evaluation materials), including a list of competencies, specifying stages of their formation, description of the indicators, and criteria of assessment competencies at different stages of their formation, the description of the scales of assessment, typical assignments or other materials necessary for the evaluation of knowledge, skills, and (or) operational experience that characterize the stages' formation of competencies in the process of mastering the educational program, training materials, defining the procedure of assessment of the knowledge, skills, proficiency and (or) operational experience that characterize the stages of competence formation have been developed in full and are available to students, on the discipline page, on the website of the RUDN University (TUIS RUDN).

The program is designed in accordance with the requirements of the RUDN University OS.

Developer:

Professor of the Department of Subsurface Use and Oil and Gas Engineering		A.N. Drozdov
position	signature	initials, surname
Teaching assistant of the Department of Subsurface Use and Oil and Gas Engineering		Ya.A. Gorbyleva
position	signature	initials, surname

Program Manager

Professor of the Department of Subsurface Use and Oil and Gas Engineering		V.M. Kapustin
position	signature	initials, surname

Director of the Department of Subsurface Use and Oil and Gas Engineering		A.E. Kotelnikov
position	signature	initials, surname

Federal State Autonomous Educational Institution
of Higher Education
«Peoples ' Friendship University of Russia»

Engineering Academy

WORKING PROGRAM OF THE DISCIPLINE

Name of the discipline: Methods for improving the ESP resource

Training area: 21.04.01 Oil and gas engineering

Program (focus (profile)): Oil and gas production and transportation technologies

1. Purpose and objectives of the discipline

The purpose of mastering the discipline Methods for improving the ESP resource are the acquisition of theoretical knowledge and practical skills for solving complex issues related to and studying the technical and operational parameters of submersible electric pump units in various conditions. Training of students in various measures to increase the inter-repair period of operation of wells equipped with ESP. General information about submersible pumping units and additional equipment.

The main **objectives** of the discipline are:
- study of activities carried out at wells to increase the service life of submersible installations in order to reduce the number of ESP failures;
- technical and operational parameters of operation of submersible electric pump units in various conditions;
- acquisition of skills in determining the cause and classification of ESP failure types.

2. Place of the discipline in the structure of the educational program

Discipline Methods for improving the ESP resource belongs to the variable part of Block 1 of the curriculum. Its study is based on the material of previous disciplines, and it is also basic for studying subsequent disciplines of the curriculum, the list of which is presented in Table 1.

Table 1-List of previous and subsequent disciplines

n/a number	Previous disciplines	Subsequent disciplines
1	Simultaneously-separate operation of wells	Small-sized ESP for side barrels / Submersible Vane pumps for Oil production / Application of Colibri ESP on cable
2	Reservoir pressure maintenance systems using multi-stage vane pumps	Project management in the oil and gas industry
3	Software package for assessing the reliability of submersible equipment based on operational data	State final certification
4	Submersible vane pump installations for oil	
5	Volumetric pumps for the extraction of viscous oil	
6	Technology and techniques of oil production by submersible pump installations in complicated conditions	
7	Universal method of selecting submersible vane pump installations for oil	
8	Intellectualization of oil production	

3. List of planned results of training in the discipline, correlated with the planned results of mastering the educational program

Discipline Methods of improving the ESP resource is aimed at developing the following competencies in students:

- able to plan and conduct analytical, simulation and experimental studies, critically evaluate data and draw conclusions (PC-1);
- it is able to analyze and summarize data on the operation of technological equipment, monitor, provide technical support and manage technological processes in the oil and gas industry (PC-2).

The result of training in the discipline is knowledge, skills, abilities and (or) experience of activity that characterize the stages of competence formation and ensure the achievement of the planned results of mastering the educational program, presented in Table 3.

Table 3-Results of training in the discipline, correlated with the planned results of mastering the OPOP in higher education

Competence	**of Knowledge**	**Skills**	**Skills**
1	2	3	4
ability to plan and conduct analytical, simulation and experimental studies, critically evaluate data and draw conclusions (PC-1)	- well designs, perforation methods and methods of development of oil and gas wells; - types of materials used for the working bodies of vane pumps.	- determine the technical and operational parameters of operation of submersible electric pump units;	- methods of technological calculation of well parameters during operation ESP.
ability to analyze and synthesize information about the work of technological equipment, OSU-implementation monitoring, technical support and management of technological processes in the oil and gas industry (PK-2)	- the basic processes occurring at different way mechanized lifting water from wells; the fundamental design of the main types of deep-well pumping and surface equipment of wells.	- to demonstrate and to adjust processes in the operation of wells for various purposes; - to apply, and maintain technology equipment used in the extraction of oil.	- methods of designing and selecting equipment for the operation of wells by electric submersible pumping units; - methods of increasing the service life of submersible units.

4. Scope of the discipline and types of academic work

Table 3-Scope of the discipline and types of academic work
for full-time education

Type of academic work		Total, acc. hours	Module 6
Classroom activities		48	48
including:			
Lectures (L)		16	16
Practical/seminar sessions (PZ)		32	32
Laboratory work (LR)			
Course project/course work			
Independent work (SRS), including control		96	96
Type of certification test			The exam
Total labor	intensity of academic hours	144	144
	credits	4	4

5. Content of the discipline

Table 4-Content of disciplines and types of classes
for fulltime education

n/a number	Name of the section of the discipline / topic of the lesson	Lecture hall .	Pract. / workshop.	Lab.	SRS	Just an hour.
	6 MODULE					
1.	**Section #1. General information about submersible pumping equipment**	**2**	**4**		**12**	**18**
	Topic 1.1. Diagram and main elements of the submersible centrifugal pump installation. Operating characteristics of a submersible centrifugal pump. Vane pump head, feed rate, and speed ratio.	1	2		6	9
	Topic 1.2. Influence of the density and viscosity of the pumped liquid on the ESP characteristic. Current reasons for ESP failures.	1	2		6	9
2.	**Section #2. Assessment of the impact of the main technological characteristics of producing wells on the ESP resource.**	**7**	**14**		**28**	**49**
	Topic 2.1. Operating conditions of the ESP. Analysis of ESP reliability.	1	2		5	8
	Topic 2.2. Technological factors contributing to the clogging of the pump with mechanical impurities. Influence of technological factors on the nature of wear of the working bodies of the ECN.	2	2		5	9

n/a number	Name of the section of the discipline / topic of the lesson	Lecture hall .	Pract. / workshop.	Lab.	SRS	Just an hour.
	Topic 2.3. The process of solid phase deposition on the working bodies of the ESP.	1	4		6	11
	Topic 2.4. Reliability parameters of the electrical part of the ESP.	1	2		6	9
	Topic 2.5. Results of studies of the effect of downhole pressure on the intensity of the salt deposition process and removal of mechanical impurities, changes in the gas-liquid flow at the ESP intake.	2	4		6	12
3.	**Section #3. Methods for increasing the ESP**	**service life 7**	**14**		**29**	**43**
	Topic 3.1. Improving the efficiency of ESP operation by rational selection and optimization of equipment	operation 2	2		6	10
	Topic 3.2. Existing physical, technological and chemical methods of salt deposition control.	1	2		5	8
	Topic 3.3. Methods of controlling the removal of mechanical impurities.	1	4		6	11
	Topic 3.4. Methods of prevention and control of asphalt-resin-paraffin substances.	1	2		6	9
	Topic 3.5. Improving the efficiency of ESP operation by improving the design.	2	4		6	12
	Exam				**27**	**27**

6. Educational technologies

Organization of classes by discipline Methods of improving the ESP resource is carried out according to the following types of educational work: practical classes/ seminars.

Implementation of the competence-based approach within the framework of the training area 21.04.01 Oil and gas engineering / Technologies of oil and gas production and transportation provides for a combination of contact work with the teacher and extracurricular independent work of students in the educational process for a more complete formation and development of their professional skills.

Lectures are held in a live audience, including using a multimedia projector in the form of an educational presentation. The main points of the lecture sessions are outlined by students, individual topics (parts of topics and sections) are offered for self-study with the obligatory compilation of a summary (checked by the teacher during the current control).

The purpose of practical classes / seminars is for students to gain knowledge and develop practical skills in solving complex issues related to the operation of oil wells equipped with ESP and their time to failure. To achieve these goals, both traditional forms

of work are used – problem solving, working with technological and socialized material sand documents, while using interactive methods-group work, analysis of specific situations, business game, etc.

Group work when analyzing a specific situation, as well as when performing laboratory work in a subgroup, develops the ability to analyze and diagnose problems. Using the method of analyzing a specific situation, students develop such qualification qualities as the ability to clearly formulate and express their position, the ability to communicate, discuss, perceive and evaluate information received in verbal form. Practical classes are held in special classrooms equipped with the necessary visual materials.

Independent work is carried out in an individual format based on the teaching materials of the discipline (*appendices2-3*). The level of mastering the material on independently studied questions of the course is checked during the current control and certification tests (exam and/or credit).) by discipline.

7. Educational, methodological and informational support of the discipline

Basic literature:

1. Bolsunovskaya L. M. [et al.] Petroleum Engineering. Course book = Oil and gas engineering. Book for students: a study guide/ edited by L. M. Bolsunovskaya, R. N. Abramova, and I. A. Matveenko. - Electron. dan. Tomsk: TPU Publ., 2014, 742 p.
https://e.lanbook.com/book/62912

2. Tetelmin V. V. Neftegazovoe delo [Oil and gas engineering]. Training manual / V. V.Tetelmin, V. A. Yazev.-2nd ed.; Dolgoprudny: Publishing House "Intellect", 2014. - 800 p.
http://lib.rudn.ru

3. Tetelmin V. V. Osnovy bureniya na neft i gaz: Uchebnoe posobie [Fundamentals of drilling for oil and gas: A textbook]. Dolgoprudny: Intellekt, 3rd ed., 2014, 296 p.
http://znanium.com/catalog/product/478822

Additional literature:

1. Sayfullin I. Sh.,Tetelmin V. V., Yazev V. A. Fizicheskie osnovy dobycha nefti: Uchebnoe posobie [Physical fundamentals of oil production: A textbook]. Dolgoprudny: Intellekt Publ., 2013, 328 p.
http://znanium.com/catalog/product/423812

2. Arbuzov V. N., Kurganova E. V. Sbornik zadach po tekhnologii dobycheniya neftya i gaza v oslozhnennykh usloviyakh: praktikum: uchebnoe posobie [Collection of problems on oil and gas production technology in complicated conditions]. - Electron. dan. Tomsk: TPU Publ., 2014, 68 p. (in Russian)
https://e.lanbook.com/book/82862

Periodicals:

1. Neftegazovaya Vertikal magazine http://ngv.ru
2. Gas Industry Magazine http://neftegas.info/gasindustry/
3. Magazines "Neftegaz.ru" http://www.neftegaz.ru

Resources of the Internet information and telecommunications network»:

1. RUDN University EBS and third-party EBS that university students have access to on the basis of concluded contracts:

-RUDN University Electronic Library System-RUDN University Electronic Library System http://lib.rudn.ru/MegaPro/Web

- EBS "University Library online" http://www.biblioclub.ru
- EBS Urite http://www.biblio-online.ru
- EBS "Student's consultant" www.studentlibrary.ru
- EBS "Lan" http://e.lanbook.com/

2. Websites of ministries, departments, services, industrial enterprises and companies whose activities are relevant for this discipline:

- Website of the Ministry of Energy of the Russian Federation https://minenergo.gov.ru
- Gazprom PJSC http://www.gazprom.ru
- PJSC LUKOIL http://www.lukoil.ru

3. Databases and search engines:

- electronic fund of legal and regulatory and technical documentation http://docs.cntd.ru/
- Yandex search engine https: / /www.yandex.ru/
- Google search engine https://www.google.ru/
- SCOPUS abstract database http://www.elsevierscience.ru/products/scopus/

Software:

1. Specialized software for conducting lectures, laboratory and practical classes and independent work of students:

- Specialized software "TransasShelf 6000 DrillingSimulator»
- License for ARMARIS software for TESP ESP

Methodological materials for students ' independent work and study of the discipline (also available in the corresponding section of the discipline in the TUIS RUDN University).):

1. Course of lectures on the discipline Methods for improving the ESP resource (*Appendix 2*).
2. Guidelines for independent work of students in the discipline Methods for improving the ESP resource (*Appendix 3*).

8. Material and technical support of the discipline

Table 5-Material and technical support of the discipline

Audience with a list of material and technical support	**Location**
Classroom # 333. A set of specialized furniture; technical means: projection screen; NEC V302X multimedia projector; DEPO Neos 220	St system unit. Podolskoe Shosse, 8k. 5

Laboratory of Mining machines room No. 358. Computer with pre-installed licensed software "ARMARIS" Intel processor Soge15, 7 pcs; "Wellhead fittings" - mock-up stand; 3D LED TV on a stand with a screen diagonal of 32 inches; Mock-up controller "Electon-09 1" from SU "Electon 05-250 " in a compact design	Ul. Podolskoe Shosse, 8k. 5
Laboratory of Mining machines, room No. 362. Set of specialized furniture; Simulator-simulator of drilling "Transas SHELF 6000 Drill"; Additional place of the trainee to the simulator-simulator of drilling "Transas SHELF 6000 Drill"	Ul. Podolskoe Shosse, 8k. 5
Laboratory of Hydrodynamic processes of oil and gas production, room No. 341. Ejector; Working table of the stand, instrumentation and control valves; Tank; Stand-model of the pump-ejector system, left view; Laser diode; Liquid column; Air compressor; Gas supply system to the column; Gas meter; Pressure gauge; Photodiode; Digital oscilloscope.	Ul. Podolskoe Shosse, 8k. 5

9. Evaluation Funds Fund

Materials for assessing the level of mastering the educational material of the discipline(evaluation materials), including a list of competencies, specifying stages of their formation, description of the indicators, and criteria of assessment competencies at different stages of their formation, the description of the scales of assessment, typical assignments or other materials necessary for the evaluation of knowledge, skills, and (or) operational experience that characterize the stages' formation of competencies in the process of mastering the educational program, training materials, defining the procedure of assessment of the knowledge, skills, proficiency and (or) operational experience that characterize the stages of competence formation have been developed in full and are available to students, on the discipline page, on the website of the RUDN University (TUIS RUDN).

The program is designed in accordance with the requirements of the RUDN University OS.

Developer:

Professor of the Department of Subsurface Use and Oil and Gas Engineering		A.N. Drozdov
position	signature	initials, surname
Teaching assistant of the Department of Subsurface Use and Oil and Gas Engineering		Ya.A. Gorbyleva
position	signature	initials, surname

Program Manager

Professor of the Department of Subsurface Use and Oil and Gas Engineering		V.M. Kapustin
position	signature	initials, surname

Director of the Department of Subsurface Use and Oil and Gas Engineering		A.E. Kotelnikov
position	signature	initials, surname

Federal State Autonomous Educational Institution
of Higher Education
«Peoples ' Friendship University of Russia»

Engineering Academy

WORKING PROGRAM OF THE DISCIPLINE

Name of the discipline: Volumetric pumps for the production of viscous oil

Training area: 21.04.01 Oil and gas engineering

Program (focus (profile)): Oil and gas production and transportation technologies

1. Purpose and objectives of the discipline

The purpose of mastering the discipline Volumetric pumps for the production of viscous oil is the acquisition of students ' theoretical knowledge and practical skills in solving complex issues related to the use of equipment in the operation of oil wells producing high-viscosity oil. Teaching students about various complications that occur during the operation of such wells. General information about submersible pumping units for high-viscosity oil production and their design.

The main **objectives** of the discipline are:
- study of equipment schemes used in the production of high-viscosity oil;
- studying the performance characteristics of equipment for high-viscosity oil production, acquiring skills in choosing a particular equipment;
- mastering the method of calculating the parameters of volumetric pumps.

2. Place of the discipline in the structure of the educational program

Discipline Volumetric pumps for the extraction of viscous oil belong to the variable part of Block 1 of the curriculum. Its study is based on the material of previous disciplines, and it is also basic for studying subsequent disciplines of the curriculum, the list of which is presented in Table 1.

Table 1-List of previous and subsequent disciplines

n/a number	Previous disciplines	Subsequent disciplines
1	Pressure maintenance systems using multistage vane pumps / Reservoir pressure maintenance systems using multistage vane pumps	Installation of submersible pumps for oil production / Installations of submersible vane pumps for oil
2	Dual completion of well for production / Simultaneously-separate operation well operation	Universal method of selection of installations of submersible pumps for oil production / Universal method of selection установок of submersible vane pump installations for добычи oil
3	Information technology in the oil and gas industry / Information technologies in the oil and gas complex	Methods of increasing the resource ESP / Methods for increasing ресурса the ESP resource
4		Software complex for assessing the reliability of submersible equipment from operational data
5		Small-sized ESP for sidetracks / Small-sized ESP for side shafts Immersible impeller pumps for oil production / Submersible vane pumps for oil production Application of Colibri ESP on cable
6		State final certification

3. List of planned results of training in the discipline, correlated with the planned results of mastering the educational program

Discipline Volumetric pumps for the production of viscous oil is aimed at developing the following competencies in students:

- with the ability to analyze and summarize data on the operation of technological equipment, monitor, provide technical support and manage technological processes in the oil and gas industry (PC-2);

-it is responsible for ensuring safe and efficient operation and operation of technological equipment in the oil and gasтindustry (PC-3).

The result of training in the discipline is knowledge, skills, abilities and (or) experience of activity that characterize the stages of competence formation and ensure the achievement of the planned results of mastering the educational program, presented in Table 3.

Table 3-Results of training in the discipline, correlated with the planned results of mastering the OPOP in higher education

Competence	of Knowledge	Skills	Skills
1	2	3	4
СпособAbility to analyze and summarize data on the operation of technological equipment, monitor, provide technical support and manage technological processes in the oil and gas industry (PC-2)	- well designs, perforation methods and methods of development of oil and gas wells; - theoretical foundations of fluid lifting from wells; - structures and flow modes of gas-liquid flows in production columns and elevator pipes of oil and gas wells.	- design well structures, drill string layouts.	- methods of technological calculation of well parameters during pumping operation
Method activities to ensure safe and efficient maintenance and operation of the production equipment to the oil and gas industry (PK-3)	- essential means of mechanized lifting water from wells; the fundamental design of the main types of deep-pumping equipment and ground wells.	- to demonstrate and to adjust processes in the operation of wells for various purposes; - use and maintenance technological equipment used in the extraction of oil, as well as in the collection and preparation of borehole products.	- methods of design and selection of equipment for the operation of wells by submersible pumping units for the extraction of oil and gas; high-viscosity oil.

4. Scope of the discipline and types of academic work

Table 3-Scope of the discipline and types of academic work

for full-time education

Type of academic work		Total, acc. hours	Module 3
Classroom activities		27	27
including:			
Lectures (L)		9	9
Practical/seminar sessions (PZ)		9	9
Laboratory work (LR)		9	9
Course project/course work			
Independent work (SRS), including control		117	117
Type of certification test			The exam
Total labor	intensity of academic hours	144	144
	credits	4	4

5. Content of the discipline

Table 4-Content of discipliness and types of classes
for full-time education

n/a number	Name of the section of the discipline / topic of the class	Lectures.	Pract. / workshop.	Lab.	SRS	Just an hour.
	3 MODULE					
1.	**Section #1. Classification, types, properties of volumetric pumps**	**2**	**2**	**2**	**20**	**26**
	Topic 1.1. Pumps with rotary motion of the working body; Pumps with translational movement of the working body.	1	1	1	10	13
	Topic 1.2. Impeller pumps, plate pumps, screw pumps, piston pumps, epistatic pumps, membrane pumps	1	1	1	10	13
2.	**Section #2. The principle of operation of the simplest volumetric pump**	**3**	**3**	**3**	**25**	**34**
	Topic 2.1. Advantages and disadvantages of volumetric pumps	1	1	1	15	18
	Topic 2.2. The process of operation of a volumetric pump in submersible pump installations for the extraction of high-viscosity oil	2	2	2	10	16
3.	**Section #3. Operating parameters of volumetric pumps**	**4**	**4**	**4**	**36**	**48**
	Topic 3.1. Working volume of the pump, theoretical pump capacity (feed), actual (actual) capacity, volumetric pump efficiency (feed ratio), nominal and overpressure, power consumed by the pump, useful pump power, total pump efficiency.	4	4	4	36	48
	Exam				**36**	**36**

6. Educational technologies

Organization of classes by discipline Volumetric pumps for the extraction of viscous oil is carried out in the following types of educational work: lectures, laboratory work, practical exercises.

Implementation of the competency-based approach within the framework of the training area 21.04.01 Oil and gas engineering / Technologies of oil and gas production and transportation provides for a combination of contact work with the teacher and extracurricular independent work of students in the educational process for a more complete formation and development of their professional skills.

Lectures are held in a live audience, including using a multimedia projector in the form of an educational presentation. The main points of the lecture sessions are outlined by students, individual topics (parts of topics and sections) are offered for self-study with the obligatory compilation of a summary (checked by the teacher during the current control).

The purpose of practical classes and laboratory work is for students to gain knowledge and develop practical skills in solving complex issues related to the operation of oil wells. To achieve these goals, both traditional forms of work are used – problem solving, working with technological equipment/specialized software when performing laboratory work, etc., and interactive methods – group work, analysis of specific situations, business game, etc.

Group work when analyzing a specific situation, as well as when performing laboratory work in a subgroup, develops the ability to analyze and diagnose problems. Using the method of analyzing a specific situation, students develop such qualification qualities as the ability to clearly formulate and express their position, the ability to communicate, discuss, perceive and evaluate information received in verbal form. Practical classes and laboratory work are conducted in special classrooms equipped with the necessary visual materials.

Independent work covers students ' study of individual issues of the theoretical course.

Independent work is carried out in an individual format based on the teaching materials of the discipline (*appendices2-4*). The level of mastering the material on independently studied questions of the course is checked during the current control and certification tests (exam and/or credit).) by discipline.

7. Educational, methodological and informational support of the discipline

Basic literature:

1. Bolsunovskaya L. M. [et al.] Petroleum Engineering. Course book = Oil and gas engineering. Book for students: a study guide/ edited by L. M. Bolsunovskaya, R. N. Abramova, and I. A. Matveenko. - Electron. dan. Tomsk: TPU Publ., 2014, 742 p.
https://e.lanbook.com/book/62912

2. Tetelmin V. V. Neftegazovoe delo [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. Osnovy bureniya na neft i gaz: Uchebnoe posobie [Fundamentals of drilling for oil and gas: A textbook]. Dolgoprudny: Intellekt, 3rd ed., 2014, 296 p.
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Additional literature:

1. Sayfullin I. Sh., Tetelmin V. V., Yazev V. A. Fizicheskie osnovy dobycha nefti: Uchebnoe posobie [Physical fundamentals of oil production: A textbook]. Dolgoprudny:

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- EBS Urite http://www.biblio-online.ru
- EBS "Student's consultant" www.studentlibrary.ru
- EBS "Lan" http://e.lanbook.com/

2. Websites of ministries, departments, services, industrial enterprises and companies whose activities are relevant for this discipline:
- Website of the Ministry of Energy of the Russian Federation https://minenergo.gov.ru
- Gazprom PJSC http://www.gazprom.ru
- PJSC LUKOIL http://www.lukoil.ru

3. Databases and search engines:
- electronic fund of legal and regulatory and technical documentation http://docs.cntd.ru/
- Yandex search engine https: / /www.yandex.ru/
- Google search engine https://www.google.ru/
- SCOPUS abstract database http://www.elsevierscience.ru/products/scopus/

Software:
1. Specialized software for conducting lectures and laboratory classes and independent work of students:
- Specialized software " TransasShelf 6000 DrillingSimulator»
- License for ARMARIS software for TESP ESP

Methodological materials for students ' independent work and study of the discipline (also available in the corresponding section of the discipline in the TUIS RUDN University)):

1. Course of lectures on the discipline Volumetric pumps for the extraction of viscous oil.

2. Guidelines for independent work of students in the discipline Volumetric pumps for the extraction of viscous oil (*Appendix 3*).

3. Laboratory workshop on the discipline Volumetric pumps for the extraction of viscous oil (*Appendix 4*).

8. Material and technical support of the discipline

Table 5-Material and technical support of the discipline

Audience with a list of material and technical support	**Location**
Classroom # 333. A set of specialized furniture; technical means: projection screen; NEC V302X multimedia projector; DEPO Neos 220	St system unit. Podolskoe Shosse, 8k. 5
Laboratory mining machines AUD. No. 358. Computer with pre-installed licensed software "of ARMARIS" Intel Core15, 7 PCs; "Wellhead valves" layout-stand; 3D LED TV at the front with a screen diagonal of 32 inches; Layout - controller "ELEKTON-09 1" from SU "ELEKTON 05-250" in a compact design	Ul. Podolskoe Shosse, 8k. 5
Laboratory of Mining machines, room No. 362. Set of specialized furniture; Simulator-simulator of drilling "Transas SHELF 6000 Drill"; Additional place of the trainee to the simulator-simulator of drilling "Transas SHELF 6000 Drill"	Ul. Podolskoe Shosse, 8k. 5
Laboratory of Hydrodynamic processes of oil and gas production, room No. 341. Ejector; Working table of the stand, instrumentation and control valves; Tank; Stand-model of the pump-ejector system, left view; Laser diode; Liquid column; Air compressor; Gas supply system to the column; Gas meter; Pressure gauge; Photodiode; Digital oscilloscope.	Ul. Podolskoe Shosse, 8k. 5

9. Evaluation Funds Fund

Materials for assessing the level of mastering the educational material of the discipline(evaluation materials), including a list of competencies, specifying stages of their formation, description of the indicators, and criteria of assessment competencies at different stages of their formation, the description of the scales of assessment, typical assignments or other materials necessary for the evaluation of knowledge, skills, and (or) operational experience that characterize the stages' formation of competencies in the process of mastering the educational program, training materials, defining the procedure of assessment of the knowledge, skills, proficiency and (or) operational experience that characterize the stages of competence formation have been developed in full and are available to students, on the discipline page, on the website of the RUDN University(TUIS RUDN).

The program is designed in accordance with the requirements of the RUDN University OS.

Developer:

Professor of the Department of Subsurface Use and Oil and Gas Engineering		A.N. Drozdov
position	signature	initials, surname
Teaching assistant of the Department of Subsurface Use and Oil and Gas Engineering		Ya.A. Gorbyleva
position	signature	initials, surname

Program Manager

Professor of the Department of Subsurface Use and Oil and Gas Engineering		V.M. Kapustin
position	signature	initials, surname

Director of the Department of Subsurface Use and Oil and Gas Engineering		A.E. Kotelnikov
position	signature	initials, surname

Federal State Autonomous Educational Institution
of Higher Education
«Peoples ' Friendship University of Russia»

Engineering Academy

WORKING PROGRAM OF THE DISCIPLINE

Name of the discipline: Dual completion of well for production

Training area: 21.04.01 Oil and gas engineering

Program (focus (profile)): Oil and gas production and transportation technologies

1. Purpose and objectives of the discipline

The purpose of mastering the discipline Dual completion of well for production is the acquisition of students' theoretical knowledge and practical skills in solving complex issues related to the use of equipment for oil production from wells in the operation of several productive formations. Training students in various complications that affect the possibility of implementing the technology of simultaneous operation of wells. General information about installations and additional equipment, that allow simultaneous production of hydrocarbons from production wells and injection of water into injection wells.

The main **objectives** of the discipline are:
- study of techniques and technologies used for simultaneous and separate well operation (EPR) in foreign and Russian oil-producing companies;
- study of the performance characteristics of EPR systems during well operation;
- acquisition of skills in choosing a particular equipment for EPR;
- mastering the methodology for calculating the characteristics of pumping equipment for EPR.

2. Place of the discipline in the structure of the educational program

Discipline Dual completion of well for production belongs to the variable part of Block 1 of the curriculum. Its study is based on the material of previous disciplines, and it is also basic for studying subsequent disciplines of the curriculum, the list of which is presented in Table 1.

Table 1-List of previous and subsequent disciplines

n/a number	Previous disciplines	Subsequent disciplines
1	Disciplines of the previous level of education	Software package for assessing the reliability of submersible equipment based on operational data
2		Universal method of selecting submersible vane pump installations for oil
3		Technology and techniques of water and gas impact on the reservoir
4		Methods for improving the ESP resource
5		Output of wells equipped with ESP to mode
6		Intellectualization of oil production
7		State certification

3. List of planned results of training in the discipline, correlated with the planned results of mastering the educational program

Discipline Dual completion of well for production is aimed at developing the following competencies in students:

- ability to evaluate the results of scientific and technical developments, scientific research and justify their own choice, systematizing and summarizing achievements in the oil and gas industry and related fields (OPC-5);

- ability to plan and conduct analytical, simulation and experimental studies, critically evaluate data and draw conclusions (PC-3).

The result of training in the discipline is knowledge, skills, abilities and (or) experience of activity that characterize the stages of competence formation and ensure the achievement of the planned results of mastering the educational program, presented in table 2.

Table 2-Results of training in the discipline, correlated with the planned results of mastering the OPOP in higher education

Competence	**of Knowledge**	**Skills**	**Skills**
1	2	3	4
ability to evaluate the results of scientific and technical developments, scientific research and justify their own choice, systematizing and summarizing achievements in the oil and gas industry and related fields (OPC-5)	- well designs, perforation methods and methods of development of oil and gas wells; - theoretical foundations of fluid lifting from wells; - structures and flow modes of gas-liquid flows in production columns and elevator pipes of oil and gas wells.	- design a program for setting the well to the mode with the-installed EPR installation.	- methods of technological calculation of well parameters during operation An EPR
has the ability to plan and conduct analytical, simulation , and experimental studies, critically evaluate data, and draw conclusions. (PC-3)	- basic methods of mechanized lifting of fluid from wells; - basic design of the main types of deep-pumping and surface equipment of wells.	- demonstrate and correct technological processes during the operation of wells for various purposes; - apply and maintain technological equipment used in oil production.	- methods of designing and selecting equipment for the operation of wells by electric submersible pumping units.

4. Scope of the discipline and types of academic work

Table 3-Scope of the discipline and types of academic work
for full-time education

Type of academic work	Total,	Module

		ak. hours	2
Classroom classes		48	48
including:			
Lectures (L)		16	16
Practical/seminar sessions (PZ)		32	32
Laboratory work (LR)			
Course project/course work			
Independent work (SRS), including control		132	132
Type of certification test			The exam
Total labor	intensity of academic hours	180	180
	credits	5	5

5. Content of the discipline

Table 4-Content of discipliness and types of classes
for fulltime education

n/a number	Name of the section of the discipline / topic of the lesson	Lecture hall .	Pract. / workshop.	Lab.	SRS	Just an hour.
	2 MODULE					
1.	**Section #1. Introduction to the EPR**	**4**	**8**		**40**	**52**
	Topic 1.1. Principles of separate operation of several formations by one well..	2	4		20	26
	Topic 1.2. Introduction and development of EPR in Russia and abroad	2	4		20	26
2.	**Section #2. Installation of equipment for simultaneous separate injection and extraction from a multi-layer deposit.**	**4**	**12**		**30**	**46**
	Topic 2.1. Variations in the development of oil reserves from a reservoir with an EPR.	2	6		20	28
	Topic 2.2 Simultaneously-separate mining using Y-TOOL systems (bypass systems)	2	6		10	**18**
3.	**Section #3. Organization of work with simultaneous and separate operation of wells**	**8**	**12**		**26**	**46**
	Topic 3.3.1:. Variations in the production of oil reserves from a reservoir with an EPR for an EPR. Types of EPR installations. Advantages and disadvantages of simultaneous and separate operation	8	12		26	46
	Exam		**6**		**30**	**36**

6. Educational technologies

Organization of classes by discipline Dual completion of well for production is carried out according to the following types of educational work: lectures, practical classes/ seminars.

Implementation of the competence-based approach within the framework of the training area 21.04.01 Oil and gas engineering / Technologies of oil and gas production and transportation provides for a combination of contact work with the teacher and extra-curricular independent work of students in the educational process for a more complete formation and development of their professional skills.

Lectures are held in a live audience, including using a multimedia projector in the form of an educational presentation. The main points of the lecture sessions are outlined by students, individual topics (parts of topics and sections) are offered for self-study with the obligatory compilation of a summary (checked by the teacher during the current control).

The purpose of practical classes / seminars is for students to gain knowledge and develop practical skills in solving complex issues related to putting oil wells equipped with ESP into operation. To achieve these goals, both traditional forms of work are used – problem solving, working with technological and socialized materials and documents, while using interactive methods-group work, analysis of specific situations, business game, etc.

Group work when analyzing a specific situation, as well as when performing laboratory work in a subgroup, develops the ability to analyze and diagnose problems. Using the method of analyzing a specific situation, students develop such qualification qualities as the ability to clearly formulate and express their position, the ability to communicate, discuss, perceive and evaluate information received in verbal form. Practical classes are held in special classrooms equipped with the necessary visual materials.

Independent work is carried out in an individual format based on the teaching materials of the discipline (*appendices 2-2-3*). The level of mastering the material on independently studied questions of the course is checked during the current control and certification tests (exam and/or credit).) by discipline.

7. Educational, methodological and informational support of the discipline

Basic literature:

1. Bolsunovskaya L. M. [et al.] Petroleum Engineering. Course book = Oil and gas business. Book for students: a study guide/ edited by L. M. Bolsunovskaya, R.N. Abramova, I. A. Matveenko. - Electron. dan. Tomsk: TPU Publ., 2014, 742 p.
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- EBS "Student's consultant" www.studentlibrary.ru
- EBS "Lan" http://e.lanbook.com/

2. Websites of ministries, departments, services, industrial enterprises and companies whose activities are relevant for this discipline:
- Website of the Ministry of Energy of the Russian Federation https://minenergo.gov.ru
- Gazprom PJSC http://www.gazprom.ru
- PJSC LUKOIL http://www.lukoil.ru

3. Databases and search engines:
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- Yandex search engine https: / /www.yandex.ru/
- Google search engine https://www.google.ru/
- SCOPUS abstract database http://www.elsevierscience.ru/products/scopus/

Software:
1. Specialized software for conducting lectures, laboratory and practical classes and independent work of students:
- Specialized software "TransasShelf 6000 DrillingSimulator»
- License for ARMARIS software for TESP ESP

Methodological materials for students ' independent work and study of the discipline (also available in the corresponding section of the discipline in the TUIS RUDN University).):

1. Course of lectures on the discipline Dual completion of well for production (*Appendix 2*).

2. Guidelines for independent work of students in the discipline Dual completion of well for production (*Appendix 3*).

8. Material and technical support of the discipline

Table 5-Material and technical support of the discipline

Audience with a list of material and technical support	**Location**
Classroom # 333. A set of specialized furniture; technical means: projection screen; NEC V302X multimedia projector; DEPO Neos 220	St system unit. Podolskoe Shosse, 8k. 5
Laboratory of Mining machines room No. 358. Computer with pre-installed licensed software "ARMARIS" Intel processor Soge15, 7 pcs; "Wellhead fittings" - mock-up stand; 3D LED TV on a stand with a screen diagonal of 32 inches; Mock-up controller "Electon-09 1" from SU "Electon 05-250" in a compact design	Ul. Podolskoe Shosse, 8k. 5
Laboratory of Mining machines, room No. 362. Set of specialized furniture; Simulator-simulator of drilling "Transas SHELF 6000 Drill"; Additional place of the trainee to the simulator-simulator of drilling "Transas SHELF 6000 Drill"	Ul. Podolskoe Shosse, 8k. 5
Laboratory of Hydrodynamic processes of oil and gas production, room No. 341. Ejector; Working table of the stand, instrumentation and control valves; Tank; Stand-model of the pump-ejector system, left view; Laser diode; Liquid column; Air compressor; Gas supply system to the column; Gas meter; Pressure gauge; Photodiode; Digital oscilloscope.	Ul. Podolskoe Shosse, 8k. 5

9. Evaluation Funds Fund

Materials for assessing the level of mastering the educational material of the discipline(evaluation materials), including a list of competencies, specifying stages of their formation, description of the indicators, and criteria of assessment competencies at different stages of their formation, the description of the scales of assessment, typical assignments or other materials necessary for the evaluation of knowledge, skills, and (or) operational experience that characterize the stages' formation of competencies in the process of mastering the educational program, training materials, defining the procedure of assessment of the knowledge, skills, proficiency and (or) operational experience that characterize the stages of competence formation have been developed in full and are available to students, on the discipline page, on the website of the RUDN University (TUIS RUDN).

The program is designed in accordance with the requirements of the RUDN University OS.

Developer:

Professor of the Department of Subsurface Use and Oil and Gas Engineering		A.N. Drozdov
position	signature	initials, surname
Teaching assistant of the Department of Subsurface Use and Oil and Gas Engineering		Ya.A. Gorbyleva
position	signature	initials, surname

Program Manager

Professor of the Department of Subsurface Use and Oil and Gas Engineering		V.M. Kapustin
position	signature	initials, surname

Director of the Department of Subsurface Use and Oil and Gas Engineering		A.E. Kotelnikov
position	signature	initials, surname

Federal State Autonomous Educational Institution
of Higher Education
«Peoples ' Friendship University of Russia»

Engineering Academy

WORKING PROGRAM OF THE DISCIPLINE

Name of the discipline: Application of ESP Colibri on geophysical cables

Training area: 21.04.01 Oil and gas engineering

Program (focus (profile)): Oil and gas production and transportation technologies

1. Purpose and objectives of the discipline

The purpose of mastering the discipline Application of ESP Colibri on geophysical cables means that students acquire theoretical knowledge and practical skills in solving complex issues related to the use of equipment of ESP installations launched on a cargo-carrying cable. Teaching students the principles of choosing pumping equipment. General information about examples of implementing ESP installations launched on a cargo-carrying cable. Influence of operating conditions on the characteristics of submersible centrifugal pumps.

The main **objectives** of the discipline are:
- study of schemes of equipment used in the operation of wells by pumping equipment lowered by cable;
- study of equipment performance characteristics,
- acquisition of skills in choosing a particular equipment;
- mastering the methodology for calculating the technological mode of wells.

2. Place of the discipline in the structure of the educational program

Discipline Application of ESP Colibri on geophysical cables belongs to the variable part of Block 1 of the curriculum. Its study is based on the material of previous disciplines, and it is also basic for studying subsequent disciplines of the curriculum, the list of which is presented in Table 1.

Table 1-List of previous and subsequent disciplines

n/a number	Previous disciplines	Subsequent disciplines
1	Dual completion of well for production	State final certification
2	Reservoir pressure maintenance systems using multi-stage vane pumps	
3	Technology and techniques of water and gas impact on the reservoir	
4	Submersible vane pump installations for oil	
5	Software package for assessing the reliability of submersible equipment based on operational data	
6	Universal method of selecting submersible vane pump installations for oil	
7	Methods for improving the ESP resource	
8	Output of wells equipped with ESP to mode	
9	Oil production intellectualization	

3. List of planned results of training in the discipline, correlated with the planned results of mastering the educational program

Discipline Application of ESP Colibri on geophysical cables is aimed at developing the following competencies in students:

- with the ability to analyze and summarize data on the operation of technological equipment, monitor, provide technical support and manage technological processes in the oil and gas industry (PC-2);

-it is responsible for ensuring safe and efficient operation and operation of technological equipment in the oil and gas industry (PC-3).

The result of training in the discipline is knowledge, skills, abilities and (or) experience of activity that characterize the stages of competence formation and ensure the achievement of the planned results of mastering the educational program, presented in Table 3.

Table 3-Results of training in the discipline, correlated with the planned results of mastering the OPOP in higher education

Competence	**of Knowledge**	**Skills**	**Skills**
1	2	3	4
Ability to analyze and summarize data on the operation of technological equipment, monitor, provide technical support and manage technological processes in the oil and gas industry (PC-2)	- well designs, perforation methods, and methods for developing oil and gas wells; - theoretical foundations for lifting fluids from wells; - structures and flow regimes of gas-liquid flows in the pipes of oil and gas wells.	- design well structures, drill string layouts.	- methods of technological calculation of well parameters during pumping operation
Ability to ensure safe and efficient operation and operation of technological equipment in the oil and gas industry (PC-3)	- basic methods of mechanized lifting of fluid from wells; - basic design of the main types of deep-pumping and ground equipment of wells.	- demonstrate and correct technological processes during the operation of wells for various purposes; - apply and maintain technological equipment used in oil production, as well as in the collection and preparation of well products.	- methods of designing and selecting equipment for the operation of wells by submersible pumping units for oil production .

4. Scope of the discipline and types of academic work

Table 3-Scope of the discipline and types of academic work
for fulltime education

Type of academic work	Total, acc. hours	Module	
		6	7
Classroom activities	48	24	24
including:			

Lectures (L)		16	8	8
Practical/seminar sessions (PZ)		16	8	8
Laboratory work (LR)		16	8	8
Course project/course work				
Independent work (SRS), including control		132	84	48
Type of certification test				The exam
Total labor	intensity of academic hours	180	108	72
	credits	5	3	2

5. Content of the discipline

Table 4-Content of discipliness and types of classes
for fulltime education

n/a number	Name of the section of the discipline / topic of the class	Lectures.	Pract. / workshop.	Lab.	SRS	Just an hour.
	6 MODULE					
1.	**Section #1. Operation of the Colibri ESP on cable**	**3**	**3**	**3**	**35**	**44**
	Topic 1.1. Operating principle of the Colibri ESP pump on	a 1	1	1	20	23 cable
	Topic 1.2. The main advantages of cable-operated pumping units. Analysis of analog developments	2	2	2	15	21
2.	**Section #2. Installation components**	**5**	**5**	**5**	**31**	**46**
	Topic 2.1. Cargo-carrying cable. Load-bearing coupling. Submersible telemetry unit	1	1	1	10	13
	Topic 2.2. Hydroprotections (upper and lower). Two-section valve electric motor.	2	2	2	10	16
	Topic 2.3. Pump sections. Gasstabilizer . Shut-off valve. Packer-anchor layout.	2	2	2	11	17
	Credit				18	18
	7 MODULE					
3.	**Section #3. Advantages of the installation Colibri ECN on cable**	**8**	**8**	**8**	**30**	**44**
	Topic 3.1. Hermetizing fountain valve module.	4	4	4	10	22
	Topic 3.2. Flanged connection of installation units.	2	2	2	10	16
	Topic 3.3. Installing the packer-anchor layout	2	2	2	10	16
	Exam				**18**	**18**

6. Educational technologies

Organization of classes by discipline Application of ESP Colibri on geophysical cables is carried out according to the following types of educational work: lectures, laboratory work, practical exercises.

Implementation of the competency-based approach within the framework of the training area 21.04.01 Oil and gas engineering / Technologies of oil and gas production and transportation provides for a combination of contact work with the teacher and extra-curricular independent work of students in the educational process for a more complete formation and development of their professional skills.

Lectures are held in a live audience, including using a multimedia projector in the form of an educational presentation. The main points of the lecture sessions are outlined by students, individual topics (parts of topics and sections) are offered for self-study with the obligatory compilation of a summary (checked by the teacher during the current control).

The purpose of practical classes is for students to gain knowledge and develop practical skills in solving complex issues related to the operation of wells with side shafts by submersible pumping units. To achieve these goals, both traditional forms of work are used – problem solving, working with technological equipment/specialized software when performing laboratory work, etc., and interactive methods – group work, analysis of specific situations, business game, etc.

Group work when analyzing a specific situation, as well as when performing laboratory work in a subgroup, develops the ability to analyze and diagnose problems. Using the method of analyzing a specific situation, students develop such qualification qualities as the ability to clearly formulate and express their position, the ability to communicate, discuss, perceive and evaluate information received in verbal form. Practical classes are held in special classrooms equipped with the necessary visual materials.

Independent work involves students working out individual questions of the theoretical course and preparing a presentation for the report.

Independent work is carried out in an individual format based on the teaching materials of the discipline (*appendices 2-4*). The level of mastering the material on independently studied questions of the course is checked during the current control and certification tests (exam and/or credit).) by discipline.

7. Educational, methodological and informational support of the discipline

Basic literature:

1. Drozdov A. N., Drozdov N. A. Tekhnologiya vodogazovogo vozdeystviya na plast dlya povysheniya nefteotdacha : uchebnoe posobie [Technology of water and gas impact on the reservoir to enhance oil recovery]. - Electronic text data. - Moscow: RUDN Publishing House, 2019. - 160 p.: ill. - ISBN 978-5-209-09638-2 : 456.56.

http://lib.rudn.ru

2. Bolsunovskaya L. M. [et al.] Petroleum Engineering. Course book = Oil and gas Engineering. Book for students: a study guide/ edited by L. M. Bolsunovskaya, R. N. Abramova, and I. A. Matveenko. - Electron. dan. Tomsk: TPU Publ., 2014, 742 p.

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

3. Tetelmin V. V. Neftegazovoe delo [Oil and gas Engineering]. Textbook / V. V. Tetelmin, V. A. Yazev.-2nd ed.; Dolgoprudny: Publishing House "Intellect", 2014. - 800 p.

http://lib.rudn.ru

Additional literature:

1. Sayfullin I. Sh., Tetelmin V. V., Yazev V. A. Fizicheskie osnovy dobycha

nefti: Uchebnoe posobie [Physical fundamentals of oil production: A textbook]. Dolgoprudny: Intellekt Publ., 2013, 328 p.
http://znanium.com/catalog/product/423812
2. Arbuzov V. N., Kurganova E. V. Sbornik zadach po tekhnologii dobycheniya neftya i gaza v oslozhnennykh usloviyakh: praktikum: uchebnoe posobie [Collection of problems on oil and gas production technology in complicated conditions]. - Electron. dan. Tomsk: TPU Publ., 2014, 68 p. (in Russian)
https://e.lanbook.com/book/82862

Periodicals:

1. Neftegazovaya Vertikal magazine http://ngv.ru
2. Gas Industry Magazine http://neftegas.info/gasindustry/
3. Magazines "Neftegaz.ru" http://www.neftegaz.ru

Resources of the Internet information and telecommunications network»:

1. RUDN University EBS and third-party EBS that university students have access to on the basis of concluded contracts:
-RUDN University Electronic Library System-RUDN University Electronic Library System http://lib.rudn.ru/MegaPro/Web
- EBS "University Library online" http://www.biblioclub.ru
- EBS Urite http://www.biblio-online.ru
- EBS "Student's consultant" www.studentlibrary.ru
- EBS "Lan" http://e.lanbook.com/

2. Websites of ministries, departments, services, industrial enterprises and companies whose activities are relevant for this discipline:
- Website of the Ministry of Energy of the Russian Federation https://minenergo.gov.ru
- Gazprom PJSC http://www.gazprom.ru
- PJSC LUKOIL http://www.lukoil.ru

3. Databases and search engines:
- electronic fund of legal and regulatory and technical documentation http://docs.cntd.ru/
- Yandex search engine https: / /www.yandex.ru/
- Google search engine https://www.google.ru/
- SCOPUS abstract database http://www.elsevierscience.ru/products/scopus/

Software:
1. Specialized software for conducting lectures, laboratory and practical classes and independent work of students:
- Specialized software " TransasShelf 6000 DrillingSimulator»
- License for ARMARIS software for TESP ESP

Methodological materials for students ' independent work and study of the discipline (also available in the corresponding section of the discipline in the TUIS RUDN University).):

1. Course of lectures on the discipline Application of ESP Colibri on geophysical cables (*Appendix 2*).
2. Guidelines for independent work of students in the discipline Application of ESP Colibri on geophysical cables (*Appendix 3*).
3. Laboratory workshop on the discipline Application of ESP Colibri on geophysical cables (*Appendix 4*).

8. Material and technical support of the discipline

Table 5-Material and technical support of the discipline

Audience with a list of material and technical support	**Location**
Classroom # 333. A set of specialized furniture; technical means: projection screen; NEC V302X multimedia projector; DEPO Neos 220	St system unit. Podolskoe Shosse, 8k. 5
Laboratory mining machines AUD. No. 358. Computer with pre-installed licensed software "of ARMARIS" Intel Core15, 7 PCs; "Wellhead valves" layout-stand; 3D LED TV at the front with a screen diagonal of 32 inches; Layout - controller "ELEKTON-09 1" from SU "ELEKTON 05-250" in a compact design	Ul. Podolskoe Shosse, 8k. 5
Laboratory of Mining machines, room No. 362. Set of specialized furniture; Simulator-simulator of drilling "Transas SHELF 6000 Drill"; Additional place of the trainee to the simulator-simulator of drilling "Transas SHELF 6000 Drill"	Ul. Podolskoe Shosse, 8k. 5
Laboratory of Hydrodynamic processes of oil and gas production, room No. 341. Ejector; Working table of the stand, instrumentation and control valves; Tank; Stand-model of the pump-ejector system, left view; Laser diode; Liquid column; Air compressor; Gas supply system to the column; Gas meter; Pressure gauge; Photodiode; Digital oscilloscope.	Ul. Podolskoe Shosse, 8k. 5

9. Evaluation Funds Fund

Materials for assessing the level of mastering the educational material of the discipline(evaluation materials), including a list of competencies, specifying stages of their formation, description of the indicators, and criteria of assessment competencies at different stages of their formation, the description of the scales of assessment, typical assignments or other materials necessary for the evaluation of knowledge, skills, and (or) operational experience that characterize the stages' formation of competencies in the process of mastering the educational program, training materials, defining the procedure of assessment of the knowledge, skills, proficiency and (or) operational experience that characterize the stages of competence formation have been developed in full and are available to students, on the discipline page, on the website of the RUDN University (TUIS RUDN).

The program is designed in accordance with the requirements of the RUDN University OS.

Developer:

Professor of the Department of Subsurface Use and Oil and Gas Engineering		A.N. Drozdov
position	signature	initials, surname
Teaching assistant of the Department of Subsurface Use and Oil and Gas Engineering		Ya.A. Gorbyleva
position	signature	initials, surname

Program Manager

Professor of the Department of Subsurface Use and Oil and Gas Engineering		V.M. Kapustin
position	signature	initials, surname

Director of the Department of Subsurface Use and Oil and Gas Engineering		A.E. Kotelnikov
position	signature	initials, surname

Federal State Autonomous Educational Institution
of Higher Education
«Peoples ' Friendship University of Russia»

Engineering Academy

WORKING PROGRAM OF THE DISCIPLINE

Name of the discipline: Software complex for assessing the reliability of submersible equipment from operational data

Training area: 21.04.01 Oil and gas engineering

Program (focus (profile)): Oil and gas production and transportation technologies

1. Purpose and objectives of the discipline

The purpose of mastering the discipline Software complex for assessing the reliability of submersible equipment from operational data is for students to acquire theoretical knowledge and practical skills in solving complex issues related to the use of equipment in the operation of oil wells. Teaching students about various complications that occur during well operation. General information about submersible pumping units and operational complications. Influence of free gas on the characteristics of submersible centrifugal pumps.

The main **objectives** of the discipline are:
- study of methods for selecting equipment used in oil production;
- studying the characteristics of equipment operation, acquiring skills in choosing a particular equipment;
- mastering the methodology for calculating the characteristics of equipment, operating technology, as well as collecting and preparing well products for transport.

2. Place of the discipline in the structure of the educational program

The discipline Software complex for assessing the reliability of submersible equipment from operational data belongs to the variable part of Block 1 of the curriculum. Its study is based on the material of previous disciplines, and it is also basic for studying subsequent disciplines of the curriculum, the list of which is presented in Table 1.

Table 1-List of previous and subsequent disciplines

n/a number	Previous disciplines	Subsequent disciplines
1	Simultaneously-separate operation of wells	Submersible vane pump installations for oil
2	Reservoir pressure maintenance systems using multi-stage vane pumps	Intellectualization of oil production
		Output of wells equipped with ESP to the operating mode
		Operation of wells by submersible water jet pumps
		State final certification

3. List of planned results of training in the discipline, correlated with the planned results of mastering the educational program

Discipline Software complex for assessing the reliability of submersible equipment from operational data is aimed at developing the following competencies in students:

- to carry out design of objects of oil and gas production (OPC-2);
- c) assess the prospects and opportunities for using the achievements of scientific and technological progress in the innovative development of the industry, and suggest ways to implement them (PC-1);
- It is able to analyze and summarize data on the operation of technological equipment, monitor, provide technical support and manage technological processes in

the oil and gas industry (PC-2).

The result of training in the discipline is knowledge, skills, abilities and (or) experience of activity that characterize the stages of competence formation and ensure the achievement of the planned results of mastering the educational program, presented in Table 3.

Table 3-Results of training in the discipline, correlated with the planned results of mastering the OPOP in higher education

Competence	**of Knowledge**	**Skills**	**Skills**
1	2	3	4
ability to design oil and gas production facilities (OPC -2)	- well designs, perforation methods and methods of development of oil and gas wells; - theoretical foundations of fluid lifting from wells; - structures and flow modes of gas-liquid flows in production columns and elevator pipes of oil and gas wells.	- design well structures, drill string layouts.	- methods of technological calculation of well parameters during fountain operation.
the ability to assess the prospects and possibilities of using the achievements of scientific and technical progress in the innovative development of the industry, and to suggest ways of their implementation (PC-1)	- the basic methods of mechanized lifting water from wells; the fundamental design of the main types of deep-well pumping and surface equipment of wells.	- to demonstrate and to adjust processes in the operation of wells for various purposes; - to apply, and maintain technology equipment used in the extraction of oil, as well as in the collection and preparation of borehole products.	- methods of design and selection of equipment in the operation of wells electropherogram pumping units.

ability to analyze and synthesize information about the work of technological equipment, supervision, technical support and management of technological processes in the oil and gas industry (PC-2)	- design of wells, methods of perforation and methods of development of oil and gas wells; - theoretical foundations of lifting water from wells; - the structure and flow regimes of gas-liquid flows in operating the columns and Elevator tubes of oil and gas wells.	- design well structures, drill string layouts.	- methods of technological calculation of well parameters during fountain operation.

4. Scope of the discipline and types of academic work

Table 3-Scope of the discipline and types of academic work
for full-time education

Type of academic work		Total, ak. hours	Module 4
Classroom sessions		40	40
including:			
Lectures (L)		8	8
Practical/seminar sessions (PZ)		16	16
Laboratory work (LR)		16	16
Course project/course work			
Independent work (SRS), including control		68	68
Type of certification test			The exam
Total labor	intensity of academic hours	108	108
	credits	3	3

5. Content of the discipline

Table 4-Content of discipliness and types of classes
for fulltime education

n/a number	Name of the section of the discipline / topic of the lesson	Lecturehall.	Pract. / workshop.	Lab.	SRS	Just an hour.
4 MODULE						
1.	**Section #1. Methodology for determining the reliability of submersible equipment and its application experience**	**4**	**8**	**8**	**12**	**32**
	Topic 1.1. Methodology for determining reliability. Reliability of the well – ESP system.	2	4	4	6	16
	Topic 1.2. Procedure for preparing data for calculations. Estimate the	2	4	4	6	16

n/a number	Name of the section of the discipline / topic of the lesson	Lecturehall.	Pract. / workshop.	Lab.	SRS	Just an hour.
	required sample size and test duration. Insufficiency of applied empirical reliability indicators.					
2.	**Section #2. Software products for submersible equipment**	**2**	**4**	**4**	**7**	**17**
	Topic 2.1. NovometSel-Pro-a program for selecting submersible installations and optimizing the plast-well-installation	system 2	4	4	7	17
3.	**Section #3. Software for control stations**	**2**	**4**	**4**	**13**	**23**
	Topic 3.1. Software KSU-02 SU "Novomet-05", "Novomet-03". Universal program for viewing the archives of the SU's work "Novomet" with KSU-02.	1	2	2	7	12
	Topic 3.2. Management of well operation efficiency by electric centrifugal pump installations	1	2	2	6	11
	Exam		**6**		**30**	**36**

6. Educational technologies

Organization of classes by the discipline Software complex for assessing the reliability of submersible equipment from operational data is carried out for the following types of educational work: laboratory work.

Implementation of the competence-based approach within the framework of the training area 21.04.01 Oil and gas engineering / Technologies of oil and gas production and transportation provides for a combination of contact work with the teacher and extracurricular independent work of students in the educational process for a more complete formation and development of their professional skills.

The purpose of practical and laboratory work is for students to gain knowledge and develop practical skills in solving complex issues related to the operation of oil wells. To achieve these goals, both traditional forms of work are used – problem solving, working with technological equipment/specialized software when performing laboratory work, etc., and interactive methods – group work, analysis of specific situations, business game, etc.

Group work when analyzing a specific situation, as well as when performing laboratory work in a subgroup, develops the ability to analyze and diagnose problems. Using the method of analyzing a specific situation, students develop such qualification qualities as the ability to clearly formulate and express their position, the ability to communicate, discuss, perceive and evaluate information received in verbal form. Practical classes and laboratory work are conducted in special classrooms equipped with the necessary visual materials.

Independent work is carried out in an individual format based on the teaching materials of the discipline (*appendices 2-2-5*). The level of mastering the material on

independently studied questions of the course is checked during the current control and certification tests (exam and/or credit).) by discipline.

7. Educational, methodological and informational support of the discipline

Basic literature:

1. Bolsunovskaya L. M. [et al.] Petroleum Engineering. Course book = Oil and gas business. Book for students: a study guide/ edited by L. M. Bolsunovskaya, R.N. Abramova, I. A. Matveenko. - Electron. dan. Tomsk: TPU Publ., 2014, 742 p.
https://e.lanbook.com/book/62912
2. Tetelmin V. V. Neftegazovoe delo [Oil and gas business]. Training manual / V. V.Tetelmin, V. A. Yazev. - 2nd ed.; Dolgoprudny: Publishing House "Intellect", 2014. - 800 p.
http://lib.rudn.ru
3. Tetelmin V. V. Osnovy bureniya na neft i gaz: Uchebnoe posobie [Fundamentals of drilling for oil and gas: A textbook]. Dolgoprudny: Intellekt, 3rd ed., 2014, 296 p.
http://znanium.com/catalog/product/478822

Additional literature:

1. Sayfullin I. Sh.,Tetelmin V. V., Yazev V. A. Fizicheskie osnovy dobycha nefti: Uchebnoe posobie [Physical fundamentals of oil production: A textbook]. Dolgoprudny: Intellekt Publ., 2013, 328 p.
http://znanium.com/catalog/product/423812
2. Arbuzov V. N. Sbornik zadach po tekhnologii dobycheniya neftya i gaza v oslozhnennykh usloviyakh: Practikum: uchebnoe posobie [Collection of problems on oil and gas production technology in complicated conditions]. Arbuzov, E. V. Kurganova. - Electron. dan. Tomsk: TPU Publ., 2014, 68 p. (in Russian)
https://e.lanbook.com/book/82862

Periodicals:

1. Neftegazovaya Vertikal magazine http://ngv.ru
2. Gas Industry Magazine http://neftegas.info/gasindustry/
3. Magazines "Neftegaz.ru" http://www.neftegaz.ru

Resources of the Internet information and telecommunications network»:

1. RUDN University EBS and third-party EBS that university students have access to on the basis of concluded contracts:

-RUDN University Electronic Library System-RUDN University Electronic Library System http://lib.rudn.ru/MegaPro/Web

- EBS "University Library online" http://www.biblioclub.ru
- EBS Urite http://www.biblio-online.ru
- EBS "Student's consultant" www.studentlibrary.ru
- EBS "Lan" http://e.lanbook.com/

2. Websites of ministries, departments, services, industrial enterprises and companies whose activities are relevant for this discipline:

- Website of the Ministry of Energy of the Russian Federation https://minenergo.gov.ru
- Gazprom PJSC http://www.gazprom.ru
- PJSC LUKOIL http://www.lukoil.ru

3. Databases and search engines:

- electronic fund of legal and regulatory and technical documentation http://docs.cntd.ru/
- Yandex search engine https: / /www.yandex.ru/
- Google search engine https://www.google.ru/
- SCOPUS abstract database http://www.elsevierscience.ru/products/scopus/

Software:

1. Specialized software for conducting lectures, laboratory and practical classes and independent work of students:

- Specialized software "TransasShelf 6000 DrillingSimulator»
- License for ARMARIS software for TESP ESP

Methodological materials for students ' independent work and study of the discipline (also available in the corresponding section of the discipline in the TUIS RUDN University).):

1. Course of lectures on the discipline Software complex for assessing the reliability of submersible equipment from operational data (*Appendix 2*).
2. Guidelines for independent work of students in the discipline Software complex for assessing the reliability of submersible equipment from operational data (*Appendix 3*).
3. Laboratory workshop on the discipline Software complex for assessing the reliability of submersible equipment from operational data (*Appendix 4*).

8. Material and technical support of the discipline

Table 5-Material and technical support of the discipline

Audience with a list of material and technical support	**Location**
Classroom # 333. A set of specialized furniture; technical means: projection screen; NEC V302X multimedia projector; DEPO Neos 220	St system unit. Podolskoe Shosse, 8k. 5
Laboratory of Mining machines room No. 358. Computer with pre-installed licensed software "ARMARIS" Intel processor Soge15, 7 pcs; "Wellhead fittings" - mock-up stand; 3D LED TV on a stand with a screen diagonal of 32 inches; Mock-up controller "Electon-09 1" from SU "Electon 05-250" in a compact design	Ul. Podolskoe Shosse, 8k. 5
Laboratory of Mining machines, room No. 362. Set of specialized furniture; Simulator-simulator of drilling "Transas SHELF 6000 Drill"; Additional place of the trainee to the simulator-simulator of drilling "Transas SHELF 6000 Drill"	Ul. Podolskoe Shosse, 8k. 5

Laboratory of Hydrodynamic processes of oil and gas production, room No. 341. Ejector; Working table of the stand, instrumentation and control valves; Tank; Stand-model of the pump-ejector system, left view; Laser diode; Liquid column; Air compressor; Gas supply system to the column; Gas meter; Pressure gauge; Photodiode; Digital oscilloscope.	Ul. Podolskoe Shosse, 8k. 5

9. Evaluation Funds Fund

Materials for assessing the level of mastering the educational material of the discipline(evaluation materials), including a list of competencies, specifying stages of their formation, description of the indicators, and criteria of assessment competencies at different stages of their formation, the description of the scales of assessment, typical assignments or other materials necessary for the evaluation of knowledge, skills, and (or) operational experience that characterize the stages' formation of competencies in the process of mastering the educational program, training materials, defining the procedure of assessment of the knowledge, skills, proficiency and (or) operational experience that characterize the stages of competence formation have been developed in full and are available to students, on the discipline page, on the website of the RUDN University (TUIS RUDN).

The program is designed in accordance with the requirements of the RUDN University OS.

Developer:

Professor of the Department of Subsurface Use and Oil and Gas Engineering		A.N. Drozdov
position	signature	initials, surname
Teaching assistant of the Department of Subsurface Use and Oil and Gas Engineering		Ya.A. Gorbyleva
position	signature	initials, surname

Program Manager

Professor of the Department of Subsurface Use and Oil and Gas Engineering		V.M. Kapustin
position	signature	initials, surname

Director of the Department of Subsurface Use and Oil and Gas Engineering		A.E. Kotelnikov
position	signature	initials, surname

Federal State Autonomous Educational Institution
of Higher Education
«Peoples ' Friendship University of Russia»

Engineering Academy

WORKING PROGRAM OF THE DISCIPLINE

Name of the discipline: Field geophysics

Training area: 21.04.01 Oil and gas engineering

Program (focus (profile)): Oil and gas production and transportation technologies

1. Purpose and objectives of the discipline

The purpose of mastering the discipline "Field geophysics" is to acquire students ' theoretical knowledge and practical skills in solving complex issues related to the study of well sections, study methods and problems solved by the methods of field geophysics.

The main **objectives** of the discipline are:
- classification of GIS methods, study of their physical bases;
- study of factors influencing the choice of a set of methods;
- mastering algorithms for interpreting research results.

2. Place of the discipline in the structure of the educational program

The discipline "Field Geophysics" refers to the elective component of the part, formed by the participants of educational relations in Block 1 of the curriculum. Its study is based on the material of previous disciplines, and it is also basic for studying subsequent disciplines of the curriculum, the list of which is presented in Table 1.

Table 1-List of previous and subsequent disciplines

n/a number	Previous disciplines	Subsequent disciplines
1	History and methodology of subsoil use	Technological practice (training program)
2	Reservoir pressure maintenance systems using multi-stage vane pumps	Technological practice (production)
3	Dual completion of well for production	Pre-graduate practice
4	Information technologies in the oil and gas industry	State final certification
5	Technology and technique of water and gas impact on the formation	

3. List of planned results of training in the discipline, correlated with the planned results of mastering the educational program

The result of training in the discipline is knowledge, skills, abilities and (or) experience of activity that characterize the stages of competence formation and ensure the achievement of the planned results of mastering the educational program, presented in table 2.

Table 2-Results of training in the discipline, correlated with the planned results of mastering the OPOP in higher education

Competence	of Knowledge	Skills	Skills
1	2	3	4
PC-1Able to plan and conduct analytical, simulation and experimental studies,	methods of analysis of information on the technological	to plan and conduct necessary experiments, and process,	inladee the ability to use physical and mathematical

to critically evaluate data and draw conclusions	process and the work of technical devices in the oil and gas industry	including application software, to interpret the results and draw appropriate conclusions; to conduct certification of technical means, systems, processes, equipment and materials	apparatus for solving analytical problems that arise in the course of professional activity

4. Scope of the discipline and types of academic work

Table 3-Scope of the discipline and types of academic work
for full-time and part-time education

Type of academic work		Total, acc. hours	Module
			6
Classroom activities		32	32
including:			
Lectures (L)		8	8
Practical exercises (Pr)		24	24
Laboratory work (LR)		-	-
Independent work (SRS), including control		112	112
Type of certification test			The exam
Total labor	144	144	144
	144	4	4

5. Content of the discipline

Table 4-Content of the discipline and types of classes
for full-time and part-time education

n/a number	Name of the section of the discipline / topic of the class	Lectures.	Pract. / workshop.	Lab.	SRS	Just an hour.
	6 Module					
1.	**Section #1. General information about field geophysics**	**1**	**4**	**-**	**14**	**19**
	Topic 1.1. General information about geophysics.	0,5	2		7	9,5
	Topic 1.2. Concepts of field and field geophysics.	0,5	2		7	9,5
2.	**Section #2. Methods of field geophysics**	**1**	**4**	**-**	**14**	**19**
	Topic 2.1. Classification of methods.	0,5	2		7	9,5
	Topic 2.2. Terms of their use.	0,5	2		7	9,5
3.	**Section #3. Physical basis of GIS methods**	**1**	**4**	**-**	**16**	**21**
	Topic 3.1. Physical basis of GIS methods.	0,5	2		8	10,5

n/a number	Name of the section of the discipline / topic of the class	Lectures.	Pract. / workshop.	Lab.	SRS	Just an hour.
	Topic 3.2. Favorable conditions for conducting research.	0,5	2		8	10,5
4.	**Section #4. GIS Interpretation**	**3**	**6**	**-**	**18**	**27**
	Topic 4.1. Individual interpretation.	1	2		6	9
	Topic 4.2. Complexes of methods.	1	2		6	9
	Topic 4.3. Interpretation algorithms.	1	2		6	9
5.	**Section #5. Interpretation of complex manifolds**	**2**	**6**	**-**	**14**	**22**
	Topic 5.1. The concept of complex manifolds.	1	3		7	11
	Topic 5.2. Principles of interpretation.	1	3		7	11
	Exam					**36**

6. Educational technologies

Organization of classes in the discipline "Field geophysics" is carried out according to the following types of academic work: lectures, practical classes.

The implementation of the competence approach in the framework of the training area 21.04.01 Oil and gas engineering provides for a combination of contact work with the teacher and extracurricular independent work of students in the educational process for a more complete formation and development of their professional skills.

Lectures are held in a live audience, including using a multimedia projector in the form of an educational presentation. The main points of the lecture sessions are outlined by students, individual topics (parts of topics and sections) are offered for self-study with the obligatory compilation of a summary (checked by the teacher during the current control).

The purpose of practical classes and laboratory work is for students to gain knowledge and develop practical skills in solving complex issues related to the operation of oil and gas wells. To achieve these goals, both traditional forms of work are used – problem solving, working with technological equipment/specialized software when performing laboratory work, etc., and interactive methods – group work, analysis of specific situations, business game, etc.

Group work when analyzing a specific situation, as well as when performing laboratory work in a subgroup, develops the ability to analyze and diagnose problems. Using the method of analyzing a specific situation, students develop such qualification qualities as the ability to clearly formulate and express their position, the ability to communicate, discuss, perceive and evaluate information received in verbal form. Practical classes and laboratory work are conducted in special classrooms equipped with the necessary visual materials.

Independent work involves students working out individual questions of the theoretical course and completing a course project.

Independent work is carried out in an individual format based on the teaching materials of the discipline (*appendices 2-5*). The level of mastering the material on independently studied questions of the course is checked during the current control and certification tests (exam and/or credit).) by discipline.

7. Educational, methodological and informational support of the discipline

Basic literature:

1. Bolsunovskaya L. M. [et al.] Petroleum Engineering. Course book = Oil and gas Engineering. Book for students: a study guide/ edited by L. M. Bolsunovskaya, R. N. Abramova, and I. A. Matveenko. - Electron. dan. Tomsk: TPU Publ., 2014, 742 p.
https://e.lanbook.com/book/62912

2. Tetelmin V. V. Neftegazovoe delo [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. Osnovy bureniya na neft i gaz: Uchebnoe posobie [Fundamentals of drilling for oil and gas: A textbook]. Dolgoprudny: Intellekt, 3rd ed., 2014, 296 p.
http://znanium.com/catalog/product/478822

Additional literature:

1. Sayfullin I. Sh., Tetelmin V. V., Yazev V. A. Fizicheskie osnovy dobycha nefti: Uchebnoe posobie [Physical fundamentals of oil production: A textbook]. Dolgoprudny: Intellekt Publ., 2013, 328 p.
http://znanium.com/catalog/product/423812

2. Arbuzov V. N., Kurganova E. V. Sbornik zadach po tekhnologii dobycheniya nefti i gaza v oslozhnennennykh usloviyakh: praktikum: uchebnoe posobie [Collection of problems on oil and gas production technology in complicated conditions]. - Electron. dan. Tomsk: TPU Publ., 2014, 68 p. (in Russian)
https://e.lanbook.com/book/82862

Periodicals:

1. Neftegazovaya Vertikal magazine http://ngv.ru
2. Gas Industry Magazine http://neftegas.info/gasindustry/
3. Magazines "Neftegaz.ru" http://www.neftegaz.ru

Resources of the Internet information and telecommunications network»:

1. RUDN University EBS and third-party EBS that university students have access to on the basis of concluded contracts:

-RUDN University Electronic Library System-RUDN University Electronic Library System http://lib.rudn.ru/MegaPro/Web

- EBS "University Library online" http://www.biblioclub.ru
- EBS Urite http://www.biblio-online.ru
- EBS "Student's consultant" www.studentlibrary.ru
- EBS "Lan" http://e.lanbook.com/

2. Websites of ministries, departments, services, industrial enterprises and companies whose activities are relevant for this discipline:

- Website of the Ministry of Energy of the Russian Federation https://minenergo.gov.ru

- Gazprom PJSC http://www.gazprom.ru
- PJSC LUKOIL http://www.lukoil.ru

3. Databases and search engines:
- electronic fund of legal and regulatory and technical documentation http://docs.cntd.ru/
- Yandex search engine https: / /www.yandex.ru/
- Google search engine https://www.google.ru/
- SCOPUS abstract database http://www.elsevierscience.ru/products/scopus/

Software:
1. Specialized software for conducting lectures and laboratory classes and independent work of students:
- Specialized software " TransasShelf 6000 DrillingSimulator»
- License for ARMARIS software for TESP ESP

Methodological materials for students ' independent work and study of the discipline (also available in the corresponding section of the discipline in the TUIS RUDN University).):

1. Course of lectures on the disciplineCommercial geophysics.
2. Guidelines for independent work of students in the disciplineField geophysics (*Appendix 3*).

8. Material and technical support of the discipline

Table 5-Material and technical support of the discipline

Audience with a list of material and technical support	**Location**
Classroom # 333. A set of specialized furniture; technical means: projection screen; NEC V302X multimedia projector; DEPO Neos 220	St system unit. Podolskoe Shosse, 8k. 5
Laboratory mining machines AUD. No. 358. Computer with pre-installed licensed software "of ARMARIS" Intel Core15, 7 PCs; "Wellhead valves" layout-stand; 3D LED TV at the front with a screen diagonal of 32 inches; Layout - controller "ELEKTON-09 1" from SU "ELEKTON 05-250" in a compact design	Ul. Podolskoe Shosse, 8k. 5
Laboratory of Mining machines, room No. 362. Set of specialized furniture; Simulator-simulator of drilling "Transas SHELF 6000 Drill"; Additional place of the trainee to the simulator-simulator of drilling "Transas SHELF 6000 Drill"	Ul. Podolskoe Shosse, 8k. 5
Laboratory of Hydrodynamic processes of oil and gas production, room No. 341. Ejector; Working table of the stand, instrumentation and control valves; Tank; Stand-model of the pump-ejector system, left view; Laser diode; Liquid column; Air compressor; Gas supply system to the column; Gas meter; Pressure gauge; Photodiode; Digital oscilloscope.	Ul. Podolskoe Shosse, 8k. 5

9. Evaluation Funds Fund

Materials for assessing the level of mastering the educational material of the discipline(evaluation materials), including a list of competencies, specifying stages of their formation, description of the indicators, and criteria of assessment competencies at different stages of their formation, the description of the scales of assessment, typical assignments or other materials necessary for the evaluation of knowledge, skills, and (or) operational experience that characterize the stages' formation of competencies in the process of mastering the educational program, training materials, defining the procedure of assessment of the knowledge, skills, proficiency and (or) operational experience that characterize the stages of competence formation have been developed in full and are available to students, on the discipline page, on the website of the RUDN University (TUIS RUDN).

The program is designed in accordance with the requirements of the RUDN University OS.

Developer:

Professor of the Department of Subsurface Use and Oil and Gas Engineering		A.N. Drozdov
position	signature	initials, surname
Teaching assistant of the Department of Subsurface Use and Oil and Gas Engineering		E.I. Gorelkina
position	signature	initials, surname

Program Manager

Professor of the Department of Subsurface Use and Oil and Gas Engineering		V.M. Kapustin
position	signature	initials, surname

Director of the Department of Subsurface Use and Oil and Gas Engineering		A.E. Kotelnikov
position	signature	initials, surname

Federal State Autonomous Educational Institution
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Engineering Academy

WORKING PROGRAM OF THE DISCIPLINE

Name of the discipline: System analysis and mathematical modeling in the oil and gas industry

Training area: 21.04.01 Oil and gas engineering

Program (focus (profile)): Oil and gas production and transportation technologies

1. Goals and objectives of the discipline

The purpose of mastering the discipline System analysis and mathematical modeling in the oil and gas industry is the acquisition of knowledge, skills and experience in the field of system analysis, as well as the formation of competencies necessary for the effective application of mathematical modeling methods for objects and processes in the oil and gas industry, reflecting the main characteristics of real physical objects. The acquired knowledge and skills characterize the stages of competence formation and ensure the achievement of the planned results of mastering the educational program.

The main **objectives** of the discipline are:

- study of practical methods and technologies for setting mathematical modeling problems, selecting factors and criteria for a mathematical model, the most effective type of mathematical models, algorithms for solving model equations, methods for predicting the parameters of object functioning based on mathematical modeling;
- acquisition of practical skills and abilities to work with methods of decomposition of mathematical modeling algorithms, methodology for selecting an acceptable differential turbulence model based on solving a set of test oil and gas problems that have physical analogies, calculate parameters of the quality of functioning of systems and objects, and have the skills of accompanying mathematical modeling for planning and controlling production processes;
- acquire the skills and abilities of mathematical modeling to justify technical design decisions, formulate the goals of mathematical modeling, set the initial parameters of modeling, know the functional features and capabilities of various modeling software products, be able to use modeling software products in computer-aided design tasks.

2. Place of the discipline in the structure of the educational program

Discipline System analysis and mathematical modeling in the oil and gas industry is a variable component of the mandatory part B of section 1 of the curriculum.

Table 1-List of previous and subsequent disciplines

n/a number	Previous disciplines	Subsequent disciplines
1	Information technologies in the oil and gas industry	Pipeline transportation systems for hydrocarbon raw
2	Fundamentals of construction and operation of pipeline transport	State final certification

3. List of planned results of training in the discipline, correlated with the planned results of mastering the educational program

Discipline System analysis and mathematical modeling in the oil and gas industry is aimed at developing the following competencies in students:

- ability to carry out a critical analysis of problem situations based on a systematic approach, develop an action strategy (UC-1);
- the ability to search for the necessary sources of information and data, to perceive, analyze, remember and transmit information using digital means, as well as using algorithms when working

with data obtained from various sources in order to effectively use the information obtained for solving problems (UC-7);

- the ability to evaluate information, its reliability, build logical conclusions based on incoming information and data (UC-7);
- ability to solve production and / or research tasks based on fundamental knowledge in the oil and gas industry (OPC-1);
- ability to analyze and summarize scientific and technical information on the research topic, choose methods and tools for solving the problem (PC-2).

The result of training in the discipline is knowledge, skills, abilities and (or) experience of activity that characterize the stages of competence formation and ensure the achievement of the planned results of mastering the educational program, presented in table 2.

Table 2

Emerging competencies

Competencies	Name of the competence	Indicators of achievement of competence achievement
UC-1	Able to carry out a critical analysis of problem situations based on a systematic approach, develop a strategy for actions	Knows methods of critical analysis and evaluation of modern scientific achievements; methods of critical analysis; basic principles of critical analysis; Knows how to analyze the task, highlighting its basic components, to carry out the decomposition of the problem; to acquire new knowledge on the basis of analysis, synthesis, etc.; to critically analyze the information needed to solve the problem; to collect data on complex scientific issues related to the professional field; to search for information and solutions on the basis of the action, experiment and experience; Proficient in the study of the problem of professional activity using analysis; synthesis and other methods of intellectual activity; identification of scientific problems and the use of adequate methods for their solution; skills of value judgments in solving problematic professional situations.
UC-7	Is able: to look for the right sources of information and data, to perceive, analyze, store and transmit information using digital tools, and with the help of algorithms when working with those obtained from various sources of data for the effective use of the information obtained to solve problems; to evaluate the information, its accuracy, to build logical reasoning on the basis of incoming information and the data	Know technology for the collection, processing, analysis and interpretation of data in digital environments; the rights and obligations governing the relationship between people, social communities, organizations; Able to assess the risks and threats associated with the use of information and communication technologies in their professional activities, is able to neutralize them available means; apply and adapt the known methods and technologies of information to new challenges, due to changing socio-economic conditions; find and analyze the relevant legal and economic information reasonably sufficient to make informed decisions; apply legal knowledge in the analysis of conflict situations; Fluent in information technology, communication, retrieval, processing and storage of information; skills at

		preventing negative economic and legal consequences of their actions or omissions.
OPC-1	Able to solve production and / or research tasks based on fundamental knowledge in the oil and gas industry	Knows methods and technologies (including innovative ones) of development in the field of oil and gas engineering; scientific and methodological support of professional activity, principles of professional ethics; Is able to carry out research activities on the development and implementation of innovative technologies in the field of oil and gas engineering; develop programs for monitoring and evaluating the results of professional activities; develop information and methodological materials in the field of professional activities; use fundamental knowledge of professional activities to solve specific problems of oil and gas production; He has the skills of physical and software modeling of individual fragments of the process of choosing the optimal option for specific conditions; the skills of analyzing the reasons for reducing the quality of technological processes and offers effective ways to improve the quality of work production when performing various technological operations; the skills of using modern tools and methods for planning and controlling projects related to
PC-2	Capable of analyzing and summarizing scientific and technical information on the research topic, selecting methods and tools for solving the problem	Knows methods for analyzing information on technological processes and the operation of technical devices in the oil and gas industry; Is able to plan and conduct necessary experiments, process, including using application software products, interpret the results and draw appropriate conclusions; carry out certification of technical means, systems, processes, equipment and materials; Has the ability to use the physical and mathematical apparatus to solve computational and analytical problems that arise in the course of professional activity.

4. Scope of the discipline and types of academic work

Table 3-Scope of the discipline and types of academic work
for full-time education

Type of academic work		Total, acc. hours	Module
			3
Classroom activities		36	36
including:			
Lectures (L)			
Practical/seminar sessions (PZ)		36	36
Laboratory work (LR)			
Course project/course work			
Independent work (SRS), including control		72	72
Type of certification test			The exam
Total labor	intensity hour	108	108
	credits	3	3

5. Content of the discipline

Table 4 – Content of discipliness and types of classes
for full-time education

n/a number	Name of the section of the discipline / topic of the lesson	Lecturehall.	Pract. / workshop.	Lab.	SRS	Just an hour.
	3 MODULE					
1.	**Section #1. Fundamentals of system analysis and mathematical modeling**	**0**	**6**		**8**	**14**
	Topic 1.1. System analysis, definition, basic concepts and relation to other disciplines,methodology of system analysis.	0	3		4	9
	Topic 1.2.,Definition and purpose of modeling,classification of models.	0	3		4	9
2.	**Section #2. Classification and stages of building mathematical models**	**0**	**6**		**8**	**14**
	Topic 2.1. Classification of mathematical models	0	3		4	9
	Topic 2.2. Stages of building a mathematical model, examples of mathematical models in the oil and gas industry	0	3		4	9
3.	**Section #3. Fundamentals of mathematical modeling of one-dimensional liquid and gas flows in a pipeline**	**0**	**9**		**15**	**24**
	Topic 3.1. Physical properties of oils and petroleumproducts .	0	3		5	9
	Topic 3.2. Integral characteristics of the liquid volume, the law of conservation of mass of the transported medium (flow continuity equation), the law of change in the amount of motion (flow motion equation).	0	3		5	9
	Topic 3.3. Complete system of equations for mathematical modeling of one-dimensional flows in a pipeline.		3		5	9
4.	**Section #4. Transport media models**	**0**	**6**		**8**	**14**
	Topic 4.1. The concept of hydraulic resistance,heat transfer coefficient.	0	3		4	9
	Topic 4.2. Model of a fluid, model of an ideal and viscous fluid, model of an incompressible fluid, mmodel of an elastic fluid, mmodel of a fluid with thermal expansion, mmodel of Newtonianfluids, model of a gaseous continuum, mmodel of a perfect and real gas, mmodel of an elastically deformable pipeline.	0	3		4	9
5.	**Section #5. Structure of laminar and turbulent fluid flows in a round tube**	**0**	**9**		**15**	**24**
	Topic 5.1. Laminar flowof a viscous fluid in a round tube, laminar flow of a non-	0	3		5	9

n/a number	Name of the section of the discipline / topic of the lesson	Lecturehall.	Pract. / workshop.	Lab.	SRS	Just an hour.
	Newtonian power-law fluid in a round tube,laminar flow of a visco-plastic fluid in a roundtube,transition of a laminar flow of a viscous fluid to a turbulent one;					
	Topic 5.2. Turbulentflow of liquid in a round tube, a method for controlling hydraulic resistance by introducing an anti-turbulent additive into the flow;	0	3		5	9
	Topic 5.3. Free flow of liquid in the pipe.		3		5	9
	Exam				**18**	**18**

6. Educational technologies

Organization of classes by discipline System analysis and mathematical modeling in the oil and gas industry is carried out according to the following types of academic work: practical classes.

The implementation of the competence-based approach in the framework of the training area 21.04.01 Oil and gas engineering provides for a combination of contact work with the teacher and extracurricular independent work of students in the educational process for a more complete formation and development of their professional skills.

The purpose of practical classes is to master theoretical and practical knowledge in the field of system analysis, as well as the formation of competencies necessary for the effective application of mathematical modeling methods for objects and processes in the oil and gas industry, reflecting the main characteristics of real physical objects. To achieve these goals, we use both traditional forms of work – problem solving, and interactive methods – group work, analysis of specific situations, business games, etc.

Group work in the analysis of a specific situation develops the ability to analyze and diagnose problems. Using the method of analyzing a specific situation, students develop such qualification qualities as the ability to clearly formulate and express their position, the ability to communicate, discuss, perceive and evaluate information received in verbal form. Practical classes are held in special classrooms equipped with the necessary visual materials.

Independent work covers students ' study of individual issues of the theoretical course.

Independent work is carried out in an individual format based on the teaching materials of the discipline (*appendices2-3*). The level of development of the material on the thoroughly studied question through the course is checked during the current control and certification tests (exam) in the discipline.

7. Educational, methodological and informational support of the discipline

Basic literature:

1. Pen R. Z., Pen V. R. Statistical methods of mathematical modeling, analysis and optimization of technological processes. 2020.

2. Lurie M. V. Mathematical modeling of pipeline transport processes for oil, oil products and gas. 2012

3. Trusov P. V. Introduction to mathematical modeling. 2014

4. Sukharev M. G., Arsenyev-Obraztsov S. S., Zhukova T. M. Osnovy matematicheskogo i komp'yuternogo modelirovaniya v zadachakh neftegazovogo kompleksa [Fundamentals of mathematical and computer modeling in problems of oil and gas production]. 2010.

Additional literature:

1. Yu. V. Vasilkov, N. N. Vasilkova Mathematical modeling of objects and automatic control systems. 2020
2. V. V. Tetelmin, V. A. Yazev. Oil and gas engineering. Full course. 2009
3. Katanov Yu. E. Mathematical modeling (Part 1, "Some problems of the oil and gas industry"). 2012
4. Katanov Yu. E. Mathematical modeling (Part 2, "Methods of mathematical physics"). 2012

Periodicals:

1. Neftegazovaya Vertikal magazine http://ngv.ru
2. Gas Industry Magazine http://neftegas.info/gasindustry/
3. Magazines "Neftegaz.ru" http://www.neftegaz.ru

Resources of the Internet information and telecommunications network»:

1. RUDN University EBS and third-party EBS that university students have access to on the basis of concluded contracts:

-RUDN University Electronic Library System-RUDN University Electronic Library System http://lib.rudn.ru/MegaPro/Web

- EBS "University Library online" http://www.biblioclub.ru
- EBS Uritehttp://www.biblio-online.ru
- EBS "Student's consultant" www.studentlibrary.ru
- EBS "Lan" http://e.lanbook.com/

2. Websites of ministries, departments, services, industrial enterprises and companies whose activities are relevant for this discipline:

- Website of the Ministry of Energy of the Russian Federation https://minenergo.gov.ru
- Gazprom PJSC http://www.gazprom.ru
- PJSC LUKOIL http://www.lukoil.ru

3. Databases and search engines:

-electronic fund of legal and regulatory and technical documentation http://docs.cntd.ru/
-Yandex search engine https: / /www.yandex.ru/
- Google search enginehttps://www.google.ru/
- theSCOPUS iterative database http:/ /www.elsevierscience.ru/products/scopus/

Software support:

No

Methodological materials for students ' independent work and study of the discipline (also available in the corresponding section of the discipline in the TUIS RUDN University).):

1. Guidelines for independent work of students in the discipline System analysis and mathematical modeling in the oil and gas industry (*Appendix 2*).

8. Material and technical support of the discipline

Table 5-Material and technical support of the discipline

Audience with a list of material and technical support	**Location**
Classroom: aud.№360 Set of specialized furniture; chalkboard; technical means: projection screen; SANYO plc xt20 multimedia projector; DEPO Neos 220 system unit	Ul. Podolskoe Shosse, 8k. 5

9. Evaluation Funds Fund

Materials for assessing the level of mastering the educational material of the discipline(evaluation materials), including a list of competencies, specifying stages of their formation, description of the indicators, and criteria of assessment competencies at different stages of their formation, the description of the scales of assessment, typical assignments or other materials necessary for the evaluation of knowledge, skills, and (or) operational experience that characterize the stages' formation of competencies in the process of mastering the educational program, training materials, defining the procedure of assessment of the knowledge, skills, proficiency and (or) operational experience that characterize the stages of competence formation have been developed in full and are available to students, on the discipline page, on the website of the RUDN University (TUIS RUDN).

The program is designed in accordance with the requirements of the RUDN University OS.

Developer:

Teaching assistant of the Department of Subsurface Use and Oil and Gas Engineering		R.V. Khakimov
position	signature	initials, surname

Program Manager

Professor of the Department of Subsurface Use and Oil and Gas Engineering		V.M. Kapustin
position	signature	initials, surname

Director of the Department of Subsurface Use and Oil and Gas Engineering		A.E. Kotelnikov
position	signature	initials, surname

Federal State Autonomous Educational Institution
of Higher Education
«Peoples ' Friendship University of Russia»

Engineering Academy

WORKING PROGRAM OF THE DISCIPLINE

Name of the discipline: Pressure maintenance systems using multistage vane pumps

Training area: 21.04.01 Oil and gas engineering

Program (focus (profile)): Oil and gas production and transportation technologies

1. Purpose and objectives of the discipline

The purpose of mastering the discipline Pressure maintenance systems using multistage vane pumps is aimed at students ' acquisition of theoretical knowledge and practical skills in solving complex issues related to the use of equipment for creating a reservoir pressure increase system by pumping water into an oil reservoir. Teaching students about various complications that arise during the operation of the PDP system. General information about pumping units and their operational complications. The influence of water sources for the PPD system on the characteristics of the entire system.

The main **objectives** of the discipline are:
- study of equipment schemes used to maintain reservoir pressure;
-studying the characteristics of equipment operation, acquiring skills in choosing a particular equipment;
- mastering the methodology for calculating the characteristics of equipment, possible APD systems, as well as water intake and treatment for injection into the reservoir.

2. Place of the discipline in the structure of the educational program

The discipline Pressure maintenance systems using multistage vane pumps belong to the variable part of Block 1 of the curriculum. Its study is based on the material of previous disciplines, and it is also basic for studying subsequent disciplines of the curriculum, the list of which is presented in Table 1.

Table 1-List of previous and subsequent disciplines

n/a number	Previous disciplines	Subsequent disciplines
1	Disciplines of the previous level of education	Dual completion of well for production
2		Technology and technology of water-gas impact on the reservoir
3		Installation of submersible pumps for oil production /Installation of submersible pumps for oil
4		Universal method of selection of installations of submersible pumps for oil production / Universal method of selecting submersible vane pump stations installations for oil production
5		Methods of increasing the resource ESP / Methods for improving the ESP resource
6		State final certification

3. List of planned results of training in the discipline, correlated with the planned results of mastering the educational program

The discipline Pressure maintenance systems using multistage vane pumps are aimed at developing the following competencies in students:

- able to evaluate the results of scientific and technical developments, scientific research and justify their own choice, systematizing and summarizing achievements in the oil and gas industry and related fields (PC-5);

-it is responsible for ensuring safe and efficient operation and operation of technological equipment in the oil and gas industry (PC-3).

The result of training in the discipline is knowledge, skills, abilities and (or) experience of activity that characterize the stages of competence formation and ensure the achievement of the planned results of mastering the educational program, presented in Table 3.

Table 3-Results of training in the discipline, correlated with the planned results of mastering the OPOP in higher education

Competence	**of Knowledge**	**Skills**	**Skills**
1	2	3	4
Ability to evaluate the results of scientific and technical developments, scientific research and justify their own choice, systematizing and summarizing achievements in the oil and gas industry and related fields (OPC-5)	- design of vane pumps; - theoretical foundations of pumping equipment operation under various connection schemes; - structures and flow modes of liquid flows in horizontal pipes, vertical pipes of injection wells.	- design the structure of the reservoir pressure maintenance system taking into account the features of the oil field and the planned well placement system.	- methods of technological calculation of vane pump parameters ; - methods of calculating hydraulic pressure losses during movement in pipes.
It is able to ensure safe and efficient operation and operation of technological equipment in the oil and gas industry (PC-3)	- basic methods of mechanized lifting of fluid from wells; - basic design of the main types of deep-pumping and surface equipment of wells.	- demonstrate and correct technological processes during the operation of wells for various purposes; - apply and maintain technological equipment used in oil production, as well as in the collection and preparation of well products.	- methods of designing and selecting equipment for the operation of wells by electric submersible pumping units.

4. Scope of the discipline and types of academic work

Table 3-Scope of the discipline and types of academic work
for full-time education

Type of academic work	Total, hours	Module 1
Classroom activities	54	54
including:		
Lectures (L)	18	18
Practical/seminar sessions (PZ)	36	36
Laboratory work (LR)		
Course project/course work		

Independent work (SRS), including control		90	90
Type of certification test			The exam
Total labor	intensity of academic hours	144	144
	credits	4	4

5. Content of the discipline

Table 4-Content of discipliness and types of classes
for full-time education

n/a number	Name of the section of the discipline / topic of the lesson	Lecture hall .	Pract. / workshop.	Lab.	SRS	Just an hour.
	1 MODULE					
1.	**Section #1. General information about pumping equipment**	**2**	**4**		**10**	**18**
	Topic 1.1. Scheme and main elements of reservoir pressure maintenance systems. Operating characteristics of a multi-stage vane pump.	1	2		5	8
	Topic 1.2. Vane pump head, feed rate, and speed ratio. Influence of the density and viscosity of the pumped liquid on the pump performance.	1	2		5	8
2.	**Section #2. Existing reservoir pressure maintenance systems**	**10**	**20**		**25**	**55**
	Topic 2.1. Water sources for PPD.Water treatment systems for PPD. Multi-level small-sized water treatment system for PPD	2	4		10	16
	Topic 2.2. The main complicating factors in the implementation of the reservoir pressure maintenance system.	2	4		5	11
	Topic 2.3. Schematic diagram of the application of equipment for the PPD system, the main purpose of the equipment.	2	4		5	11
	Topic 2.4. Examples of implementation of reservoir pressure maintenance systems for Russian deposits.	4	8		10	22
3.	**Section #3. Application of pumping units in the reservoir pressure maintenance system**	**6**	**12**		**14**	**32**
	Topic 3.1. Basic information about pumping units of the CNS, UTSGN and ESN types and their characteristics.	2	4		7	13
	Topic 3.2. Comparative analysis of the use of various pumping units (such as CNS, USGN and ESN) in the PPD system	4	8		7	19
	Exam				**36**	**36**

6. Educational technologies

Organization of classes by the discipline Pressure maintenance systems using multi-stage vane pumps are conducted according to the following types of educational work: lectures, laboratory work, practical exercises.

Implementation of the competency-based approach within the framework of the training area 21.04.01 Oil and gas engineering / Technologies of oil and gas production and transportation provides for a combination of contact work with the teacher and extracurricular independent work of students in the educational process for a more complete formation and development of their professional skills.

Lectures are held in a live audience, including using a multimedia projector in the form of an educational presentation. The main points of the lecture sessions are outlined by students, individual topics (parts of topics and sections) are offered for self-study with the obligatory compilation of a summary (checked by the teacher during the current control).

The purpose of practical classes is for students to gain knowledge and develop practical skills in solving complex issues related to the operation of oil and gas wells. To achieve these goals, both traditional forms of work are used – problem solving, working with technological equipment/specialized software when performing laboratory work, etc., and interactive methods – group work, analysis of specific situations, business game, etc.

Group work when analyzing a specific situation, as well as when performing laboratory work in a subgroup, develops the ability to analyze and diagnose problems. Using the method of analyzing a specific situation, students develop such qualification qualities as the ability to clearly formulate and express their position, the ability to communicate, discuss, perceive and evaluate information received in verbal form. Practical classes and laboratory work are conducted in special classrooms equipped with the necessary visual materials.

Independent work covers students ' study of individual issues of the theoretical course.

Independent work is carried out in an individual format based on the teaching materials of the discipline (*appendices 2-3*). The level of mastering the material on independently studied questions of the course is checked during the current control and certification tests (exam and/or credit).) by discipline.

7. Educational, methodological and informational support of the discipline

Basic literature:

1. Bolsunovskaya L. M. [et al.] Petroleum Engineering. Course book = Oil and gas Engineering. Book for students: a study guide/ edited by L. M. Bolsunovskaya, R.N. Abramova, I. A. Matveenko. - Electron. dan. Tomsk: TPU Publ., 2014, 742 p.
https://e.lanbook.com/book/62912

2. Tetelmin V. V. Neftegazovoe delo [Oil and gas Engineering]. Training manual / V. V.Tetelmin, V. A. Yazev. - 2nd ed.; Dolgoprudny: Publishing House "Intellect", 2014. - 800 p.
http://lib.rudn.ru

3. Tetelmin V. V. Osnovy bureniya na neft i gaz: Uchebnoe posobie [Fundamentals of drilling for oil and gas: A textbook]. Dolgoprudny: Intellekt, 3rd ed., 2014, 296 p.
http://znanium.com/catalog/product/478822

Additional literature:

1. Sayfullin I. Sh.,Tetelmin V. V., Yazev V. A. Fizicheskie osnovy dobycha nefti: Uchebnoe posobie [Physical fundamentals of oil production: A textbook]. Dolgoprudny: Intellekt Publ., 2013, 328 p.
http://znanium.com/catalog/product/423812

2. Arbuzov V. N. Sbornik zadach po tekhnologii dobycheniya neftya i gaza v oslozhnennykh usloviyakh: Practikum: uchebnoe posobie [Collection of problems on oil and gas production technology in complicated conditions]. Arbuzov, E. V. Kurganova. - Electron. dan. Tomsk: TPU Publ., 2014, 68 p. (in Russian)
https://e.lanbook.com/book/82862

Periodicals:

1. Neftegazovaya Vertikal magazine http://ngv.ru
2. Gas Industry Magazine http://neftegas.info/gasindustry/
3. Magazines "Neftegaz.ru" http://www.neftegaz.ru

Resources of the Internet information and telecommunications network»:

1. RUDN University EBS and third-party EBS that university students have access to on the basis of concluded contracts:
-RUDN University Electronic Library System-RUDN University Electronic Library System http://lib.rudn.ru/MegaPro/Web
- EBS "University Library online" http://www.biblioclub.ru
- EBS Urite http://www.biblio-online.ru
- EBS "Student's consultant" www.studentlibrary.ru
- EBS "Lan" http://e.lanbook.com/

2. Websites of ministries, departments, services, industrial enterprises and companies whose activities are relevant for this discipline:
- Website of the Ministry of Energy of the Russian Federation https://minenergo.gov.ru
- Gazprom PJSC http://www.gazprom.ru
- PJSC LUKOIL http://www.lukoil.ru

3. Databases and search engines:
- electronic fund of legal and regulatory and technical documentation http://docs.cntd.ru/
- Yandex search engine https: / /www.yandex.ru/
- Google search engine https://www.google.ru/
- SCOPUS abstract database http://www.elsevierscience.ru/products/scopus/

Software:
1. Specialized software for conducting lectures and laboratory classes and independent work of students:
- Specialized software "TransasShelf 6000 DrillingSimulator»
- License for ARMARIS software for TESP ESP

Methodological materials for students ' independent work and study of the discipline (also available in the corresponding section of the discipline in the TUIS RUDN University).):

1. Course of lectures on the discipline Pressure maintenance systems using multistage vane pumps (*Appendix 2*).

2. Guidelines for independent work of students in the discipline Pressure maintenance systems using multistage vane pumps (*Appendix 3*).

8. Material and technical support of the discipline

Table 5-Material and technical support of the discipline

Audience with a list of material and technical support	**Location**
Classroom # 333. A set of specialized furniture; technical means: projection screen; NEC V302X multimedia projector; DEPO Neos 220	St system unit. Podolskoe Shosse, 8k. 5
Laboratory of Mining machines room No. 358. Computer with pre-installed licensed software "ARMARIS" Intel processor Soge15, 7 pcs; "Wellhead fittings" - mock-up stand; 3D LED TV on a stand with a screen diagonal of 32 inches; Mock-up controller "Electon-09 1" from SU "Electon 05-250 " in a compact design	Ul. Podolskoe Shosse, 8k. 5
Laboratory of Mining machines, room No. 362. Set of specialized furniture; Simulator-simulator of drilling "Transas SHELF 6000 Drill"; Additional place of the trainee to the simulator-simulator of drilling "Transas SHELF 6000 Drill"	Ul. Podolskoe Shosse, 8k. 5
Laboratory of Hydrodynamic processes of oil and gas production, room No. 341. Ejector; Working table of the stand, instrumentation and control valves; Tank; Stand-model of the pump-ejector system, left view; Laser diode; Liquid column; Air compressor; Gas supply system to the column; Gas meter; Pressure gauge; Photodiode; Digital oscilloscope.	Ul. Podolskoe Shosse, 8k. 5

9. Evaluation Funds Fund

Materials for assessing the level of mastering the educational material of the discipline(evaluation materials), including a list of competencies, specifying stages of their formation, description of the indicators, and criteria of assessment competencies at different stages of their formation, the description of the scales of assessment, typical assignments or other materials necessary for the evaluation of knowledge, skills, and (or) operational experience that characterize the stages' formation of competencies in the process of mastering the educational program, training materials, defining the procedure of assessment of the knowledge, skills, proficiency and (or) operational experience that characterize the stages of competence formation have been developed in full and are available to students, on the discipline page, on the website of the RUDN University (TUIS RUDN).

The program is designed in accordance with the requirements of the RUDN University OS.

Developer:

Professor of the Department of Subsurface Use and Oil and Gas Engineering		A.N. Drozdov
position	signature	initials, surname
Teaching assistant of the Department of Subsurface Use and Oil and Gas Engineering		Ya.A. Gorbyleva
position	signature	initials, surname

Program Manager

Professor of the Department of Subsurface Use and Oil and Gas Engineering		V.M. Kapustin
position	signature	initials, surname

Director of the Department of Subsurface Use and Oil and Gas Engineering		A.E. Kotelnikov
position	signature	initials, surname

Federal State Autonomous Educational Institution
of Higher Education
«Peoples ' Friendship University of Russia»

Engineering Academy

WORKING PROGRAM OF THE DISCIPLINE

Name of the discipline: Technology and technique of oil production by submersible pumps in complicated conditions

Training area: 21.04.01 Oil and gas engineering

Program (focus (profile)): Oil and gas production and transportation technologies

1. Purpose and objectives of the discipline

The purpose of mastering the discipline Technology and technique of oil production by submersible pumps in complicated conditions is the acquisition of students ' theoretical knowledge and practical skills in solving complex issues related to the use of equipment in the operation of oil wells. Teaching students about various complications that occur during well operation. General information about submersible pumping units and operational complications. Influence of product parameters (free gas, viscosity, etc.) on the characteristics of submersible centrifugal pumps.

The main **objectives** of the discipline are:
- study of schemes of equipment used in oil production;
-studying the characteristics of equipment operation, acquiring skills in choosing a particular equipment;
- mastering the methodology for calculating the characteristics of equipment, operating technology, as well as collecting and preparing well products for transport.

2. Place of the discipline in the structure of the educational program

The discipline Technology and technique of oil production by submersible pumps in complicated conditions belongs to the variable part of Block 1 of the curriculum. Its study is based on the material of previous disciplines, and it is also basic for studying subsequent disciplines of the curriculum, the list of which is presented in Table 1.

Table 1-List of previous and subsequent disciplines

n/a number	Previous disciplines	Subsequent disciplines
1	Pressure maintenance systems using multistage vane pumps / Reservoir pressure maintenance systems using multistage vane pumps	Installation of submersible pumps for oil production / Installations of submersible vane pumps for oil
2	Dual completion of well for production / Simultaneously-separate operation well operation	Universal method of selection of installations of submersible pumps for oil production / Universal method of selecting submersible stations vane pump installations for oil production
3		Methods of increasing the resource ESP / Methods for improving the ESP resource
4		State final certification

3. List of planned results of training in the discipline, correlated with the planned results of mastering the educational program

The discipline Technology and technique of oil production by submersible pumps in complicated conditions is aimed at developing the following competencies in students:

- with the ability to analyze and summarize data on the operation of technological equipment, monitor, provide technical support and manage technological processes in the oil and gas industry (PC-2);

-it is responsible for ensuring safe and efficient operation and operation of technological equipment in the oil and gas industry (PC-3).

The result of training in the discipline is knowledge, skills, abilities and (or) experience of activity that characterize the stages of competence formation and ensure the achievement of the planned results of mastering the educational program, presented in Table 3.

Table 3-Results of training in the discipline, correlated with the planned results of mastering the OPOP in higher education

Competence	**of Knowledge**	**Skills**	**Skills**
1	2	3	4
It is able to analyze and summarize data on the operation of technological equipment, monitor, provide technical support and manage technological processes in the oil and gas industry (PC-2)	- well designs, perforation methods and methods of development of oil and gas wells; - theoretical foundations of fluid lifting from wells; - structures and flow modes of gas-liquid flows in production columns and elevator pipes of oil and gas wells.	- design well structures, drill string layouts.	- methods of technological calculation of well parameters during fountain operation.
It is able to ensure safe and efficient operation and operation of technological equipment in the oil and gas industry (PC-3)	- basic methods of mechanized lifting of fluid from wells; - basic design of the main types of deep-pumping and surface equipment of wells.	- demonstrate and correct technological processes during the operation of wells for various purposes; - apply and maintain technological equipment used in oil production, as well as in the collection and preparation of well products.	- methods of designing and selecting equipment for the operation of wells by electric submersible pumping units.

4. Scope of the discipline and types of academic work

Table 3-Scope of the discipline and types of academic work
for full-time education

Type of academic work	Total, ak. hours	Module 3
Classroom activities	27	27
including:		
Lectures (L)	9	9

Practical/seminar sessions (PZ)		9	9
Laboratory work (LR)		9	9
Course project/course work			
Independent work (SRS), including control		117	117
Type of certification test			The exam
Total labor	intensity of academic hours	144	144
	credits	4	4

5. Content of the discipline

Table 4-Content of discipliness and types of classes
for full-time education

n/a number	Name of the section of the discipline / topic of the class	Lectures.	Pract. / workshop.	Lab.	SRS	Just an hour.
	3 MODULE					
1.	**Section #1. General information about submersible pumping equipment**	**2**	**2**	**2**	**20**	**36**
	Topic 1.1. Diagram and main elements of the submersible centrifugal pump installation. Operating characteristics of a submersible centrifugal pump. Vane pump head, feed rate, and speed ratio.	1	1	1	10	13
	Topic 1.2. Influence of the density and viscosity of the pumped liquid on the ESP characteristic. The main complicating factors in the operation of wells by submersible pumps. Prospects for the application of software forloaded pumping units.	1	1	1	10	13
2.	**Section #2. Influence of free gas and viscosity on the characteristics of submersible centrifugal pumps**	**2**	**2**	**2**	**25**	**31**
	Topic 2.1. Flow patterns of the gas-liquid mixture in the channels of the working bodies of the centrifugal pump. Parameters that affect the characteristics of submersible centrifugal pumps when pumping out GZHS. Installation design, selection of model gas-liquid mixtures, and experimental methods for studying the effect of free gas on the characteristics of submersible centrifugal pumps. Investigation of the effect of gas on the characteristics of a submersible centrifugal pump when operating on model mixtures "water-gas", "water-surfactant-gas" and various receiving pressures.	1	1	1	15	18
	Topic 2.2. Results of a study of the operation of submersible centrifugal pumps on viscous gas-liquid mixtures "oil-gas".	1	1	1	10	13

n/a number	Name of the section of the discipline / topic of the class	Lectures.	Pract. / workshop.	Lab.	SRS	Just an hour.
	Analysis of average integral parameters of submersible centrifugal pumps operating on gas-liquid mixtures. Method of calculating the characteristics of submersible centrifugal pumps for pumping water from oil and gas mixtures from wells.					
3.	**Section #3. Separation-free methods for improving the efficiency of ESP operation when pumping gas-liquid mixtures**	**1**	**1**	**1**	**10**	**13**
	Topic 3.1. Pump depth under the dynamic fluid level in the well. Adding degassed liquid to the annulus. Using a "conical" pump scheme. Application of pumps with dispersants. Using steps of special structures.	1	1	1	10	13
4.	**Section #4. Application of gas and mechanical impurity separators to ESP**	**2**	**2**	**2**	**24**	**30**
	Topic 4.1. The main types of gas separators for ESP. Field tests of MNG separators. The effect of super cavitation and its role in the working process of the gas separator to the ESP. Bench studies and field tests of MN-GSL and MNG gas separators and REDA separators.	1	1	1	12	15
	Topic 4.2. Experimental studies of the characteristics of gas separators and gas separators-dispersants to the ESP at different temperatures personal shaft rotation frequencies. Development and field testing of a centrifugal separator for mechanical impurities at the inlet of a submersible pumping unit. Extraction of natural gas from waterlogged gas wells and methane from coal deposits using submersible pumping systems.	1	1	1	12	15
5.	**Section #5. Use of pumping and ejector systems for oil**	**production 2**	**2**	**2**	**20**	**26**
	Topic 5.1. Scheme and principle of operation of the jet apparatus. Schematic diagrams and basic elements of pumping and ejector systems. Characteristics of joint operation of submersible centrifugal pumps and ejectors. Results of field testing and industrial implementation of Tandem submersible pump and ejector systems.	1	1	1	10	13

n/a number	Name of the section of the discipline / topic of the class	Lectures.	Pract. / workshop.	Lab.	SRS	Just an hour.
	Topic 5.2. Field studies of packer hydraulic jet pumping units at the Samotlorskoye field. Development and field testing of a packer-less hydraulic jet pump layout with a double-row elevator. Opportunities for the development of the hydro jet method of operation using power ground mini-stations.	1	1	1	10	13
	Exam				**18**	**18**

6. Educational technologies

Organization of classes by the discipline Technology and technique of oil production by submersible pumps in complicated conditions is carried out according to the following types of educational work: lectures, laboratory work, practical exercises.

Implementation of the competency-based approach within the framework of the training area 21.04.01 Oil and gas engineering / Technologies of oil and gas production and transportation provides for a combination of contact work with the teacher and extracurricular independent work of students in the educational process for a more complete formation and development of their professional skills.

Lectures are held in a live audience, including using a multimedia projector in the form of an educational presentation. The main points of the lecture sessions are outlined by students, individual topics (parts of topics and sections) are offered for self-study with the obligatory compilation of a summary (checked by the teacher during the current control).

The purpose of practical classes and laboratory work is for students to gain knowledge and develop practical skills in solving complex issues related to the operation of oil and gas wells. To achieve these goals, both traditional forms of work are used – problem solving, working with technological equipment/specialized software when performing laboratory work, etc., and interactive methods – group work, analysis of specific situations, business game, etc.

Group work when analyzing a specific situation, as well as when performing laboratory work in a subgroup, develops the ability to analyze and diagnose problems. Using the method of analyzing a specific situation, students develop such qualification qualities as the ability to clearly formulate and express their position, the ability to communicate, discuss, perceive and evaluate information received in verbal form. Practical classes and laboratory work are conducted in special classrooms equipped with the necessary visual materials.

Independent work covers students ' study of individual issues of the theoretical course.

Independent work is carried out in an individual format based on the teaching materials of the discipline (*appendices2-5*). The level of mastering the material on independently studied questions of the course is checked during the current control and certification tests (exam and/or credit).) by discipline.

7. Educational, methodological and informational support of the discipline

Basic literature:

1. Bolsunovskaya L. M. [et al.] Petroleum Engineering. Course book = Oil and gas

engineering. Book for students: a study guide/ edited by L. M. Bolsunovskaya, R. N. Abramova, and I. A. Matveenko. - Electron. dan. Tomsk: TPU Publ., 2014, 742 p.
https://e.lanbook.com/book/62912
2. Tetelmin V. V. Neftegazovoe delo [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. Osnovy bureniya na neft i gaz: Uchebnoe posobie [Fundamentals of drilling for oil and gas: A textbook]. Dolgoprudny: Intellekt, 3rd ed., 2014, 296 p.
http://znanium.com/catalog/product/478822

Additional literature:

1. Sayfullin I. Sh., Tetelmin V. V., Yazev V. A. Fizicheskie osnovy dobycha nefti: Uchebnoe posobie [Physical fundamentals of oil production: A textbook]. Dolgoprudny: Intellekt Publ., 2013, 328 p.
http://znanium.com/catalog/product/423812
2. Arbuzov V. N., Kurganova E. V. Sbornik zadach po tekhnologii dobycheniya neftya i gaza v oslozhnennykh usloviyakh: Practikum: uchebnoe posobie [Collection of problems on oil and gas production technology in complicated conditions]. - Electron. dan. Tomsk: TPU Publ., 2014, 68 p. (in Russian)
https://e.lanbook.com/book/82862

Periodicals:

1. Neftegazovaya Vertikal magazine http://ngv.ru
2. Gas Industry Magazine http://neftegas.info/gasindustry/
3. Magazines "Neftegaz.ru" http://www.neftegaz.ru

Resources of the Internet information and telecommunications network»:

1. RUDN University EBS and third-party EBS that university students have access to on the basis of concluded contracts:

-RUDN University Electronic Library System-RUDN University Electronic Library System http://lib.rudn.ru/MegaPro/Web

- EBS "University Library online" http://www.biblioclub.ru
- EBS Urite http://www.biblio-online.ru
- EBS "Student's consultant" www.studentlibrary.ru
- EBS "Lan" http://e.lanbook.com/

2. Websites of ministries, departments, services, industrial enterprises and companies whose activities are relevant for this discipline:

- Website of the Ministry of Energy of the Russian Federation https://minenergo.gov.ru
- Gazprom PJSC http://www.gazprom.ru
- PJSC LUKOIL http://www.lukoil.ru

3. Databases and search engines:

- electronic fund of legal and regulatory and technical documentation http://docs.cntd.ru/
- Yandex search engine https: / /www.yandex.ru/

- Google search engine https://www.google.ru/
- SCOPUS abstract database http://www.elsevierscience.ru/products/scopus/

Software:

1. Specialized software for conducting lectures and laboratory classes and independent work of students:

- Specialized software " TransasShelf 6000 DrillingSimulator»
- License for ARMARIS software for TESP ESP

Methodological materials for students ' independent work and study of the discipline (also available in the corresponding section of the discipline in the TUIS RUDN University).):

1. Course of lectures on the discipline Technology and techniques of oil production by submersible pumps in complicated conditions.
2. Guidelines for independent work of students in the discipline Technology and techniques of oil production by submersible pumps in complicated conditions (*Appendix 3*).
3. Laboratory workshop on the discipline Technology and techniques of oil production by submersible pumps in complicated conditions (*Appendix 5*).

8. Material and technical support of the discipline

Table 5-Material and technical support of the discipline

Audience with a list of material and technical support	**Location**
Classroom # 333. A set of specialized furniture; technical means: projection screen; NEC V302X multimedia projector; DEPO Neos 220	St system unit. Podolskoe Shosse, 8k. 5
Laboratory mining machines AUD. No. 358. Computer with pre-installed licensed software "of ARMARIS" Intel Core15, 7 PCs; "Wellhead valves" layout-stand; 3D LED TV at the front with a screen diagonal of 32 inches; Layout - controller "ELEKTON-09 1" from SU "ELEKTON 05-250" in a compact design	Ul. Podolskoe Shosse, 8k. 5
Laboratory of Mining machines, room No. 362. Set of specialized furniture; Simulator-simulator of drilling "Transas SHELF 6000 Drill"; Additional place of the trainee to the simulator-simulator of drilling "Transas SHELF 6000 Drill"	Ul. Podolskoe Shosse, 8k. 5
Laboratory of Hydrodynamic processes of oil and gas production, room No. 341. Ejector; Working table of the stand, instrumentation and control valves; Tank; Stand-model of the pump-ejector system, left view; Laser diode; Liquid column; Air compressor; Gas supply system to the column; Gas meter; Pressure gauge; Photodiode; Digital oscilloscope.	Ul. Podolskoe Shosse, 8k. 5

9. Evaluation Funds Fund

Materials for assessing the level of mastering the educational material of the discipline(evaluation materials), including a list of competencies, specifying stages of their formation, description of the indicators, and criteria of assessment competencies at different stages of their formation, the description of the scales of assessment, typical assignments or other materials necessary for the evaluation of knowledge, skills, and (or) operational experience that characterize the stages' formation of competencies in the process of mastering the educational program, training materials, defining the procedure of assessment of the

knowledge, skills, proficiency and (or) operational experience that characterize the stages of competence formation have been developed in full and are available to students, on the discipline page, on the website of the RUDN University (TUIS RUDN).

The program is designed in accordance with the requirements of the RUDN University OS.

Developer:

Professor of the Department of Subsurface Use and Oil and Gas Engineering		A.N. Drozdov
position	signature	initials, surname
Teaching assistant of the Department of Subsurface Use and Oil and Gas Engineering		Ya.A. Gorbyleva
position	signature	initials, surname

Program Manager

Professor of the Department of Subsurface Use and Oil and Gas Engineering		V.M. Kapustin
position	signature	initials, surname

Director of the Department of Subsurface Use and Oil and Gas Engineering		A.E. Kotelnikov
position	signature	initials, surname

Federal State Autonomous Educational Institution
of Higher Education
«Peoples ' Friendship University of Russia»

Engineering Academy

WORKING PROGRAM OF THE DISCIPLINE

Name of the discipline: Technology and technique of water-gas impact on the reservoir

Training area: 21.04.01 Oil and gas engineering

Program (focus (profile)): Oil and gas production and transportation technologies

1. Purpose and objectives of the discipline

The purpose of mastering the discipline Technology and technique of water-gas impact on the reservoir is the acquisition of theoretical knowledge and practical skills for students to solve complex issues related to the use of equipment in the implementation of water and gas impact on oil and gas reservoirs. Training students in various options for implementing the technology, depending on the source of gas, the state of field development. General information examples of implementing a water-gas system with pumping and ejector units and other equipment for simultaneous and alternate injection of oil and gas. Influence of free gas on the characteristics of submersible centrifugal pumps.

The main **objectives** of the discipline are:
- study of equipment schemes used for water and gas exposure;
- studying the characteristics of equipment operation, acquiring skills in choosing a particular equipment;
- study of the method of calculating strings, operation technology, as well as collecting and preparing well products for transport.

2. Place of the discipline in the structure of the educational program

The discipline The technology and technique of water-gas impact on the reservoir belongs to the variable part of Block 1 of the curriculum. Its study is based on the material of previous disciplines, and it is also basic for studying subsequent disciplines of the curriculum, the list of which is presented in Table 1.

Table 1-List of previous and subsequent disciplines

n/a number	Previous disciplines	Subsequent disciplines
1	Simultaneously-separate operation of wells	Submersible vane pump installations for oil
2	Reservoir pressure maintenance systems using multi-stage vane pumps	Intellectualization of oil production
		Output of wells equipped with ESP to the operating mode
		Operation of wells by submersible water jet pumps
		State final certification

3. List of planned results of training in the discipline, correlated with the planned results of mastering the educational program

The discipline The Technology and technique of water-gas impact on the reservoir is aimed at developing the following competencies in students:

- to carry out professional activities in accordance with the legal acts in the field of education and the norms of professional ethics; and (OPC-1);

-operate and maintain technological equipment used in the construction, repair, reconstruction and restoration of oil and gas wells, oil and gas production, collection and

preparation of well products, transportation and storage of hydrocarbon raw materials (PC-2).

The result of training in the discipline is knowledge, skills, abilities and (or) experience of activity that characterize the stages of competence formation and ensure the achievement of the planned results of mastering the educational program, presented in Table 3.

Table 3-Results of training in the discipline, correlated with the planned results of mastering the OPOP in higher education

Competence	**of Knowledge**	**Skills**	**Skills**
1	2	3	4
ability carry out professional activities in accordance with the legal acts in the field of education and the norms of professional ethics (PC-1)	- well designs, perforation methods and methods of development of oil and gas wells; - theoretical foundations of fluid lifting from wells; - structures and flow modes of gas-liquid flows in production columns and elevator pipes of oil and gas wells.	- design well structures, drill string layouts.	- methods of technological calculation of well parameters during fountain operation.
ability to operate and maintain the technological equipment used in the construction, repair, reconstruction and restoration of oil and gas wells, oil and gas, the collection and preparation of borehole production, transport and storage of hydrocarbons (PC-2)	- the main methods of mechanized lifting water from wells; the fundamental design of the main types of deep-well pumping and surface equipment of wells.	- to demonstrate and to adjust processes in the operation of wells for various purposes; - to apply, and maintain technology equipment used in the extraction of oil, as well as in the collection and preparation of borehole products.	- methods of designing and selecting equipment for the operation of wells by electric submersible pumping units.

4. Scope of the discipline and types of academic work

Table 3-Scope of the discipline and types of academic work
for fulltime education

Type of academic work	Total, hours	Module	
		2	3
Classroom activities	84	48	36
including:			
Lectures (L)	34	16	18
Practical/seminar sessions (PZ)	50	32	18

Laboratory work (LR)				
Course project/course work				
Independent work (SRS), including control		132	96	36
Type of certification test				The exam
Total labor	intensity of academic hours	216	144	72
	credits	6	4	2

5. Content of the discipline

Table 4-Content of discipliness and types of classes
for fulltime education

n/a number	Name of the section of the discipline / topic of the lesson	Lecture hall .	Pract. / workshop.	Lab.	SRS	Just an hour.
2 MODULE						
1.	**Section #1. General information about water and gas impact on an oil reservoir**	**4**	**8**		**20**	**32**
	Topic 1.1. Diagram and operating principle of the jet unit	2	4		10	16
	Topic 1.2. Schematic diagrams of pumping and ejector systems	2	4		10	16
2.	**Section #2. Jet apparatuses as part of pumping and ejector systems for water and gas exposure**	**12**	**24**		**44**	**80**
	Topic 2.1. Hydraulic characteristics of jet pumps for homogeneous liquids. Cavitation characteristics.	2	4		12	18
	Topic 2.2. Design features of the flow part of water jet pumps with a central nozzle.	2	2		10	14
	Topic 2.3. Analytical calculation of the characteristics of the jet apparatus.	2	4		10	16
	Topic 2.4. Characteristics of ejectors when pumping liquid and gas with a liquid jet / gas jet	1	2		10	13
	Topic 2.5. Features of operation of jet apparatuses when injecting a gas-liquid mixture into the nozzle.	1	2		10	13
	Topic 2.6: Characteristics of joint operation of submersible centrifugal pumps and ejectors.	2	4		12	18
	Topic 2.7: Prospects of water-gas impact on the formation using pump-ejector systems.	2	6		12	20
3 MODULE						
3.	**Section #3. Use of pumping and ejector systems for oil**	**production 18**	**18**		**14**	**50**
	Topic 3.1. Results of field tests and industrial implementation of Tandem-1	10	9		3	22

n/a number	Name of the section of the discipline / topic of the lesson	Lecture hall .	Pract. / workshop.	Lab.	SRS	Just an hour.
	submersible pump and ejector systems, tests of new Tandem-2, Tandem-3 and Tandem-4 submersible pump and ejector systems.					
	Topic 3.2. Field studies of packer water jet pumping units at theThe Samotlor field.	8	9		6	23
	Exam		**6**		**21**	**27**

6. Educational technologies

Organization of classes by the discipline Technology and techniques of water-gas impact on the reservoir is carried out according to the following types of educational work: lectures, laboratory work, practical exercises.

Implementation of the competency-based approach within the framework of the training area 21.04.01 Oil and gas engineering / Technologies of oil and gas production and transportation provides for a combination of contact work with the teacher and extracurricular independent work of students in the educational process for a more complete formation and development of their professional skills.

Lectures are held in a live audience, including using a multimedia projector in the form of an educational presentation. The main points of the lecture sessions are outlined by students, individual topics (parts of topics and sections) are offered for self-study with the obligatory compilation of a summary (checked by the teacher during the current control).

The purpose of practical classes is for students to gain knowledge and develop practical skills in solving complex issues related to the technology of implementing water and gas effects on oil reservoirs. To achieve these goals, both traditional forms of work are used – problem solving, working with technological equipment/specialized software when performing laboratory work, etc., and interactive methods – group work, analysis of specific situations, business game, etc.

Group work when analyzing a specific situation, as well as when performing laboratory work in a subgroup, develops the ability to analyze and diagnose problems. Using the method of analyzing a specific situation, students develop such qualification qualities as the ability to clearly formulate and express their position, the ability to communicate, discuss, perceive and evaluate information received in verbal form. Practical classes are held in special classrooms equipped with the necessary visual materials.

Independent work involves students working out individual questions of the theoretical course and preparing a presentation for the report.

Independent work is carried out in an individual format based on the teaching materials of the discipline (*appendices 2-2-5*). The level of mastering the material on independently studied questions of the course is checked during the current control and certification tests (exam and/or credit).) by discipline.

7. Educational, methodological and informational support of the discipline

Basic literature:

1. Reservoir water and gas impact technology for enhanced oil recovery : textbook / A. N. Drozdov, N. A. Drozdov. - Electronic text data. - Moscow : RUDN Publishing House, 2019. - 160 p.: ill. - ISBN 978-5-209-09638-2 : 456.56.
http://lib.rudn.ru

2. Bolsunovskaya L. M. [et al.] Petroleum Engineering. Course book = Oil and gas engineering. Book for students: a study guide/ edited by L. M. Bolsunovskaya, R.N. Abramova, I. A. Matveenko. - Electron. dan. Tomsk: TPU Publ., 2014, 742 p.
https://e.lanbook.com/book/62912

3. Tetelmin V. V. Neftegazovoe delo [Oil and gas engineering]. Training manual / V. V.Tetelmin, V. A. Yazev. - 2nd ed.; Dolgoprudny: Publishing House "Intellect", 2014. - 800 p.
http://lib.rudn.ru

Additional literature:

1. Sayfullin I. Sh.,Tetelmin V. V., Yazev V. A. Fizicheskie osnovy dobycha nefti: Uchebnoe posobie [Physical fundamentals of oil production: A textbook]. Dolgoprudny: Intellekt Publ., 2013, 328 p.
http://znanium.com/catalog/product/423812

2. Arbuzov V. N. Sbornik zadach po tekhnologii dobycheniya neftya i gaza v oslozhnennykh usloviyakh: Practikum: uchebnoe posobie [Collection of problems on oil and gas production technology in complicated conditions]. Arbuzov, E. V. Kurganova. - Electron. dan. Tomsk: TPU Publ., 2014, 68 p. (in Russian)
https://e.lanbook.com/book/82862

Periodicals:

1. Neftegazovaya Vertikal magazine http://ngv.ru
2. Gas Industry Magazine http://neftegas.info/gasindustry/
3. Magazines "Neftegaz.ru" http://www.neftegaz.ru

Resources of the Internet information and telecommunications network»:

1. RUDN University EBS and third-party EBS that university students have access to on the basis of concluded contracts:

-RUDN University Electronic Library System-RUDN University Electronic Library System http://lib.rudn.ru/MegaPro/Web

- EBS "University Library online" http://www.biblioclub.ru
- EBS Urite http://www.biblio-online.ru
- EBS "Student's consultant" www.studentlibrary.ru
- EBS "Lan" http://e.lanbook.com/

2. Websites of ministries, departments, services, industrial enterprises and companies whose activities are relevant for this discipline:

- Website of the Ministry of Energy of the Russian Federation https://minenergo.gov.ru
- Gazprom PJSC http://www.gazprom.ru
- PJSC LUKOIL http://www.lukoil.ru

3. Databases and search engines:

- electronic fund of legal and regulatory and technical documentation http://docs.cntd.ru/
- Yandex search engine https: / /www.yandex.ru/
- Google search engine https://www.google.ru/
- SCOPUS abstract database http://www.elsevierscience.ru/products/scopus/

Software:

1. Specialized software for conducting lectures, laboratory and practical classes and independent work of students:

- Specialized software "TransasShelf 6000 DrillingSimulator»
- License for ARMARIS software for TESP ESP

Methodological materials for students ' independent work and study of the discipline (also available in the corresponding section of the discipline in the TUIS RUDN University).):

1. Course of lectures on the disciplineTechnology and techniques of water-gas impact on the formation (*Appendix 2*).
2. Guidelines for independent work of students in the disciplineTechnology and techniques of water-gas impact on the formation (*Appendix 3*).
3. Guidelines for completing a course project in the disciplineTechnology and techniques of water-gas impact on the formation (Appendix 4).

8. Material and technical support of the discipline

Table 5-Material and technical support of the discipline

Audience with a list of material and technical support	**Location**
Classroom # 333. A set of specialized furniture; technical means: projection screen; NEC V302X multimedia projector; DEPO Neos 220	St system unit. Podolskoe Shosse, 8k. 5
Laboratory of Mining machines room No. 358. Computer with pre-installed licensed software "ARMARIS" Intel processor Soge15, 7 pcs; "Wellhead fittings" - mock-up stand; 3D LED TV on a stand with a screen diagonal of 32 inches; Mock-up controller "Electon-09 1" from SU "Electon 05-250" in a compact design	Ul. Podolskoe Shosse, 8k. 5
Laboratory of Mining machines, room No. 362. Set of specialized furniture; Simulator-simulator of drilling "Transas SHELF 6000 Drill"; Additional place of the trainee to the simulator-simulator of drilling "Transas SHELF 6000 Drill"	Ul. Podolskoe Shosse, 8k. 5
Laboratory of Hydrodynamic processes of oil and gas production, room No. 341. Ejector; Working table of the stand, instrumentation and control valves; Tank; Stand-model of the pump-ejector system, left view; Laser diode; Liquid column; Air compressor; Gas supply system to the column; Gas meter; Pressure gauge; Photodiode; Digital oscilloscope.	Ul. Podolskoe Shosse, 8k. 5

9. Evaluation Funds Fund

Materials for assessing the level of mastering the educational material of the discipline(evaluation materials), including a list of competencies, specifying stages of their formation, description of the indicators, and criteria of assessment competencies at different stages of their formation, the description of the scales of assessment, typical assignments or other materials necessary for the evaluation of knowledge, skills, and (or) operational experience that characterize the stages' formation of competencies in the process of mastering the educational program, training materials, defining the procedure of assessment of the knowledge, skills, proficiency and (or) operational experience that characterize the stages of competence formation have been developed in full and are available to students, on the discipline page, on the website of the RUDN University (TUIS RUDN).

The program is designed in accordance with the requirements of the RUDN University OS.

Developer:

Professor of the Department of Subsurface Use and Oil and Gas Engineering		A.N. Drozdov
position	signature	initials, surname
Teaching assistant of the Department of Subsurface Use and Oil and Gas Engineering		Ya.A. Gorbyleva
position	signature	initials, surname

Program Manager

Professor of the Department of Subsurface Use and Oil and Gas Engineering		V.M. Kapustin
position	signature	initials, surname

Director of the Department of Subsurface Use and Oil and Gas Engineering		A.E. Kotelnikov
position	signature	initials, surname

Federal State Autonomous Educational Institution
of Higher Education
«Peoples ' Friendship University of Russia»

Engineering Academy

WORKING PROGRAM OF THE DISCIPLINE

Name of the discipline: Universal method of selecting submersible vane pump installations for oil production.

Training area: 21.04.01 Oil and gas engineering

Program (focus (profile)): Oil and gas production and transportation technologies

1. Purpose and objectives of the discipline

The purpose of mastering the discipline A universal method of selecting submersible vane pump installations for oil production is the acquisition by students of theoretical knowledge and practical skills in selecting equipment that is part of submersible installations for oil production from wells. Training of students in the applied selection methods, research of conditions that complicate the operation of submersible vane pump installations.

The main **objectives** of the discipline are:
- study of methods and selection of submersible pumping equipment;
- study of the characteristics of pumping equipment in the production of well products;
- acquisition of skills in choosing a particular equipment;
- study of conditions that complicate the operation of wells with pumping equipment.

2. Place of the discipline in the structure of the educational program

Discipline The universal method of selecting submersible vane pump installations for oil production belongs to the variable part of Block 1 of the curriculum. Its study is based on the material of previous disciplines, and it is also basic for studying subsequent disciplines of the curriculum, the list of which is presented in Table 1.

Table 1-List of previous and subsequent disciplines

n/a number	Previous disciplines	Subsequent disciplines
1	Simultaneously-separate operation of wells	Methods for improving the ESP
2 resource	Reservoir pressure maintenance systems using multi-stage vane pumps	Output of wells equipped with ESP to mode
3	Software package for assessing the reliability of submersible equipment based on operational data	Small-sized ESP for side barrels / Submersible Vane pumps for Oil production / Application of Colibri ESP on cable
4	Submersible vane pump installations for oil production	State final certification
5	Volumetric pumps for the extraction of viscous oil	
6	Technology and techniques of oil production by submersible pump installations in complicated conditions	

3. List of planned results of training in the discipline, correlated with the planned results of mastering the educational program

Discipline The universal method of selecting submersible vane pump installations for oil production is aimed at developing the following competencies in students:

- is able to find and process the information required for decision-making in scientific research and in practical technical activities (OPK-4);
- able to plan and conduct analytical, simulation and experimental studies, critically evaluate data and draw conclusions (PC-1).

The result of training in the discipline is knowledge, skills, abilities and (or) experience of activity that characterize the stages of competence formation and ensure the achievement of the planned results of mastering the educational program, presented in Table 3.

Table 3-Results of training in the discipline, correlated with the planned results of mastering the OPOP in higher education

Competence	**of Knowledge**	**Skills**	**Skills**
1	2	3	4
ability to find and process information required for decision-making in scientific research and in practical technical activities (AboutPC-4)	- well designs, perforation methods and methods of development of oil and gas wells; - theoretical foundations of fluid lifting from wells; - structures and flow modes of gas-liquid flows in production columns and elevator pipes of oil and gas wells.	- design a program for setting the well to the mode with the installed ESP.	- methods for technological calculation of well parameters during operation ESP.
ability to plan and conduct analytical, simulation and experimental studies, to critically evaluate data and draw conclusions (PK-1)	- the basic methods of mechanized lifting water from wells; the fundamental design of the main types of deep-well pumping and surface equipment of wells.	- to demonstrate and to adjust processes in the operation of wells for various purposes; - to apply, and maintain technology equipment used in the extraction of oil.	- methods of designing and selecting equipment for the operation of wells by electric submersible pumping units.

4. Scope of the discipline and types of academic work

Table 3-Scope of the discipline and types of academic work
for full-time education

Type of academic work		Total, acc. hours	Module 5
Classroom activities		36	36
including:			
Lectures (L)		9	9
Practical/seminar sessions (PZ)		27	27
Laboratory work (LR)			
Course project/course work			
Independent work (SRS), including control		108	108
Type of certification test			The exam
Total labor	intensity of academic hours	144	144
	credits	4	4

5. Content of the discipline

Table 4-Content of disciplines and types of classes
for fulltime education

n/a number	Name of the section of the discipline / topic of the lesson	Lecturehall.	Pract. / workshop.	Lab.	SRS	Just an hour.
	5 MODULE					
1.	**Section #1. Complete set of ESP**	**2**	**6**		**26**	**34**
	Topic 1.1. General scheme of installation of a submersible centrifugal electric pump. Elements of the installation's electrical equipment.	1	3		13	17
	Topic 1.2. Submersible pump unit. Installation of a special-purpose PCEN. Determination of the suspension depth of PCEN	1	3		13	17
2.	**Section #2. Operation of wells by submersible centrifugal electric pumps**	**2**	**6**		**10**	**18**
	Topic 2.1. Installations of submersible centrifugal pumps (ESP) for oil extraction from wells.	1	3		5	9
	Topic 2.2. Modular submersible centrifugal pumps of the ECND type. MNGB gas separatorsMNGB type gas separators	1	3		5	9
3.	**Section #3. Selection of a submersible centrifugal pump**	**5**	**15**		**36**	**56**
	Topic 3.1. Methods for calculating pressure distribution curves.	2	6		12	20

n/a number	Name of the section of the discipline / topic of the lesson	Lecturehall.	Pract. / workshop.	Lab.	SRS	Just an hour.
	Topic 3.2. Determining the depth of equipment installation.	1	3		12	16
	Topic 3.3. Calculation of a submersible centrifugal pump for forced liquid extraction	2	6		12	20
	Exam				**36**	**36**

6. Educational technologies

Organization of classes by discipline The universal method of selecting submersible vane pump installations for oil production is carried out according to the following types of educational work: practical classes/ seminars.

Implementation of the competence-based approach within the framework of the training area 21.04.01 Oil and gas engineering / Technologies of oil and gas production and transportation provides for a combination of contact work with the teacher and extracurricular independent work of students in the educational process for a more complete formation and development of their professional skills.

Lectures are held in a live audience, including using a multimedia projector in the form of an educational presentation. The main points of the lecture sessions are outlined by students, individual topics (parts of topics and sections) are offered for self-study with the obligatory compilation of a summary (checked by the teacher during the current control).

The purpose of practical classes / seminars is for students to gain knowledge and develop practical skills in solving complex issues related to the selection of equipment for well operation with submersible vane pumps. To achieve these goals, both traditional forms of work are used – problem solving, working with technological and socialized materials and documents, while using interactive methods-group work, analysis of specific situations, business game, etc.

Group work when analyzing a specific situation, as well as when performing laboratory work in a subgroup, develops the ability to analyze and diagnose problems. Using the method of analyzing a specific situation, students develop such qualification qualities as the ability to clearly formulate and express their position, the ability to communicate, discuss, perceive and evaluate information received in verbal form. Practical classes are held in special classrooms equipped with the necessary visual materials.

Independent work is carried out in an individual format based on the teaching materials of the discipline (*appendices2-3*). The level of mastering the material on independently studied questions of the course is checked during the current control and certification tests (exam and/or credit).) by discipline.

7. Educational, methodological and informational support of the discipline

Basic literature:

1. Bolsunovskaya L. M. [et al.] Petroleum Engineering. Course book = Oil and gas engineering. Book for students: a study guide/ edited by L. M. Bolsunovskaya, R.N.

Abramova, I. A. Matveenko. - Electron. dan. Tomsk: TPU Publ., 2014, 742 p.
https://e.lanbook.com/book/62912
2. Tetelmin V. V. Neftegazovoe delo [Oil and gas engineering]. Training manual / V. V.Tetelmin, V. A. Yazev. - 2nd ed.; Dolgoprudny: Publishing House "Intellect", 2014. - 800 p.
http://lib.rudn.ru
3. Tetelmin V. V. Osnovy bureniya na neft i gaz: Uchebnoe posobie [Fundamentals of drilling for oil and gas: A textbook]. Dolgoprudny: Intellekt, 3rd ed., 2014, 296 p.
http://znanium.com/catalog/product/478822

Additional literature:

1. Sayfullin I. Sh.,Tetelmin V. V., Yazev V. A. Fizicheskie osnovy dobycha nefti: Uchebnoe posobie [Physical fundamentals of oil production: A textbook]. Dolgoprudny: Intellekt Publ., 2013, 328 p.
http://znanium.com/catalog/product/423812
2. Arbuzov V. N. Sbornik zadach po tekhnologii dobycheniya neftya i gaza v oslozhnennykh usloviyakh: praktikum: uchebnoe posobie [Collection of problems on oil and gas production technology in complicated conditions]. Arbuzov, E. V. Kurganova. - Electron. dan. Tomsk: TPU Publ., 2014, 68 p. (in Russian)
https://e.lanbook.com/book/82862

Periodicals:

1. Neftegazovaya Vertikal magazine http://ngv.ru
2. Gas Industry Magazine http://neftegas.info/gasindustry/
3. Magazines "Neftegaz.ru" http://www.neftegaz.ru

Resources of the Internet information and telecommunications network»:

1. RUDN University EBS and third-party EBS that university students have access to on the basis of concluded contracts:

-RUDN University Electronic Library System-RUDN University Electronic Library System http://lib.rudn.ru/MegaPro/Web
- EBS "University Library online" http://www.biblioclub.ru
- EBS Urite http://www.biblio-online.ru
- EBS "Student's consultant" www.studentlibrary.ru
- EBS "Lan" http://e.lanbook.com/

2. Websites of ministries, departments, services, industrial enterprises and companies whose activities are relevant for this discipline:

- Website of the Ministry of Energy of the Russian Federation https://minenergo.gov.ru
- Gazprom PJSC http://www.gazprom.ru
- PJSC LUKOIL http://www.lukoil.ru

3. Databases and search engines:

- electronic fund of legal and regulatory and technical documentation http://docs.cntd.ru/
- Yandex search engine https: / /www.yandex.ru/
- Google search engine https://www.google.ru/
- SCOPUS abstract database http://www.elsevierscience.ru/products/scopus/

Software:

1. Specialized software for conducting lectures, laboratory and practical classes and independent work of students:
- Specialized software "TransasShelf 6000 DrillingSimulator»
- License for ARMARIS software for TESP ESP

Methodological materials for students ' independent work and study of the discipline (also available in the corresponding section of the discipline in the TUIS RUDN University).):

1. Course of lectures on the discipline Output of wells equipped with ESP to the mode (*Appendix 2*).
2. Guidelines for independent work of students in the discipline Universal method of selection of submersible vane pump installations for oil production (*Appendix 3*).

8. Material and technical support of the discipline

Table 5-Material and technical support of the discipline

Audience with a list of material and technical support	**Location**
Classroom # 333. A set of specialized furniture; technical means: projection screen; NEC V302X multimedia projector; DEPO Neos 220	St system unit. Podolskoe Shosse, 8k. 5
Laboratory of Mining machines room No. 358. Computer with pre-installed licensed software "ARMARIS" Intel processor Soge15, 7 pcs; "Wellhead fittings" - mock-up stand; 3D LED TV on a stand with a screen diagonal of 32 inches; Mock-up controller "Electon-09 1" from SU "Electon 05-250 " in a compact design	Ul. Podolskoe Shosse, 8k. 5
Laboratory of Mining machines, room No. 362. Set of specialized furniture; Simulator-simulator of drilling "Transas SHELF 6000 Drill"; Additional place of the trainee to the simulator-simulator of drilling "Transas SHELF 6000 Drill"	Ul. Podolskoe Shosse, 8k. 5
Laboratory of Hydrodynamic processes of oil and gas production, room No. 341. Ejector; Working table of the stand, instrumentation and control valves; Tank; Stand-model of the pump-ejector system, left view; Laser diode; Liquid column; Air compressor; Gas supply system to the column; Gas meter; Pressure gauge; Photodiode; Digital oscilloscope.	Ul. Podolskoe Shosse, 8k. 5

9. Evaluation Funds Fund

Materials for assessing the level of mastering the educational material of the discipline(evaluation materials), including a list of competencies, specifying stages of their

formation, description of the indicators, and criteria of assessment competencies at different stages of their formation, the description of the scales of assessment, typical assignments or other materials necessary for the evaluation of knowledge, skills, and (or) operational experience that characterize the stages' formation of competencies in the process of mastering the educational program, training materials, defining the procedure of assessment of the knowledge, skills, proficiency and (or) operational experience that characterize the stages of competence formation have been developed in full and are available to students, on the discipline page, on the website of the RUDN University(TUIS RUDN).

The program is designed in accordance with the requirements of the RUDN University OS.

Developer:

Professor of the Department of Subsurface Use and Oil and Gas Engineering		A.N. Drozdov
position	signature	initials, surname
Teaching assistant of the Department of Subsurface Use and Oil and Gas Engineering		Ya.A. Gorbyleva
position	signature	initials, surname

Program Manager

Professor of the Department of Subsurface Use and Oil and Gas Engineering		V.M. Kapustin
position	signature	initials, surname

Director of the Department of Subsurface Use and Oil and Gas Engineering		A.E. Kotelnikov
position	signature	initials, surname

Federal State Autonomous Educational Institution
of Higher Education
«Peoples ' Friendship University of Russia»

Engineering Academy

WORKING PROGRAM OF THE DISCIPLINE

Name of the discipline: Project management in the oil and gas industry

Training area: 21.04.01 Oil and gas engineering

Program (focus (profile)): Oil and gas production and transportation technologies

1. Goals and objectives of the discipline

The purpose of mastering the discipline Project management in the oil and gas industry is the acquisition of knowledge, skills and experience in the field of project management in the oil and gas industry. The acquired knowledge and skills characterize the stages of competence formation and ensure the achievement of the planned results of mastering the educational program.

The main **objectives** of the discipline are:

- To study the methodology of project management in the oil and gas industry.
- To study the principles and processes, phase approach in managing large projects.
- To study design stages in the development of oil and gas fields.
- Develop skills in managing large projects at all stages of the life cycle.
- Develop project cost management skills.
- Develop project risk management skills.
- Master calendar and resource planning and preparation of the project's contract strategy.
- Learn how to increase project value.
- Master project management within the framework of a matrix structure.
- Master the analysis and application of best project implementation practices.

2. Place of the discipline in the structure of the educational program

Discipline Project management in the oil and gas industry is a variable component of the mandatory part B of section 1 of the curriculum.

Table 1-List of previous and subsequent disciplines

n/a number	Previous disciplines	Subsequent disciplines
1	Economics and management of oil and gas production	Pre-graduate practice
2	Management of oil and gas transportation systems	State final certification

3. List of planned results of training in the discipline, correlated with the planned results of mastering the educational program

Discipline Project management in the oil and gas industry is aimed at developing the following competencies in students::

- ability to manage the project at all stages of its life cycle (UC-2);
- with the ability to design oil and gas production facilities (OPC-2);
- ability to plan and conduct analytical, simulation and experimental studies, critically evaluate data and draw conclusions (PC-3);

The result of training in the discipline is knowledge, skills, abilities and (or) experience of activity that characterize the stages of competence formation and ensure the achievement of the planned results of mastering the educational program, presented in table 2.

Table 2

Emerging competencies

Competencies	Name of the competence	Indicators of achievement of competence achievement
UC-2 competence	Able to manage a project at all stages of its life cycle	Knows the methods of solving specific project tasks of the declared quality and in a set time; the basics of designing and solving a specific project task, choosing the best way to solve it, based on current legal norms and available resources and restrictions; Is able to formulate a set of interrelated tasks that ensure its achievement within the framework of the set project goal; Has the skills of forecasting and determining the expected results of solving selected tasks; skills of public presentation of the results of solving a specific project task.
OPC-2	Capable of designing oil and gas production facilities	Knows the regulatory legal documents regulating the requirements for professional activity; the algorithm for organizing work during the design of oil and gas production facilities; aspects of working in contact with a supervisor; Is able to apply methods and technology for designing the main and additional processes of oil and gas production; formulate the goals of work and suggests ways to achieve them; master the methodology and technology for designing oil and gas production facilities; apply an activity-based approach to design tasks in the field of oil and gas production; evaluate the convergence of calculation results obtained using various methods; Proficient in the principles and techniques of designing oil and gas production facilities; methods of developing a scientific and methodological approach to designing oil and gas production processes; has the skills to quickly fulfill the requirements of a work project; skills to work in modern PCs, using new methods and software packages.
PC-3	Able to plan and conduct analytical, simulation and experimental studies, critically evaluate data and draw conclusions	Knows how to operate and maintain technological equipment used in the transportation and storage of oil and petroleum products; Is able to conduct technological processes of operation and perform technological maintenance of equipment used in the system of transportation and storage of oil and petroleum products; Has the skills of practical work on the equipment used in the operation of the oil and oil products transportation and storage system.

4. Scope of the discipline and types of academic work

Table 3-Scope of the discipline and types of academic work
for full-time education

Type of academic work	Total, acc. hours	Module
		7
Classroom sessions	40	40
including:		
Lectures (L)	10	10

Practical/seminar sessions (PZ)		30	30
Laboratory work (LR)			
Course project/course work			
Independent work (SRS), including control		104	104
Type of certification test			The exam
Total labor	intensity hour	144	144
	credits	4	4

5. Content of the discipline

Table 4 – Content of discipliness and types of classes
for full-time education

n/a number	Name of the section of the discipline / topic of the class	Lectures.	Pract. / workshop.	Lab.	SRS	Just an hour.
	7 MODULE					
1.	**Section #1. Project Management Basics**	**2**	**4**		**14**	**20**
	Topic 1.1. Project stages, The concept of an Artifact,distribution of artifacts by project stages,new artefacts by project (IT);	1	2		7	9
	Topic 1.2. Types of orders, mulberryRACI.	1	2		7	9
2.	**Section #2. Golden triangle of the manager**	**2**	**5**		**16**	**23**
	Topic 2.1. Triangle Manager, how to manage the sides of a triangle	1	2		8	9
	Topic 2.2. Priority matrix, for reporting project constraints to the customer;	1	3		8	9
3.	**Section #3. Collecting and analyzing information before starting a project**	**2**	**7**		**16**	**25**
	Topic 3.1. Key questions for understanding the project.	0,5	2		4	9
	Topic 3.2. What is MVP and release plan.	0,5	2		4	9
	Topic 3.3. Problem decomposition and what it islike.	1	3		4	9
4.	**Section #4. Development of a project implementation plan**	**1**	**5**		**8**	**14**
	Topic 4.1. What resources need to be evaluated for project implementation, andhow the final deadline for project completion is formed.	0,5	2		4 9	9
	Topic 4.2. How to prioritize work and create releasesthat are influenced bythat are affected by external factors.	0,5	3		4	9
5.	**Section #5. Risk management**	**1**	**4**		**17**	**22**
	Topic 5.1. Market analysis, competitoranalysis;	0.5	2		8	9
	Topic 5.2. Target audience analysis;	0.5	2		9	9
6.	**Section #6. Budgeting and Unit Economics**	**1**	**5**		**16**	**22**
	Topic 6.1. Cost estimate elements, Unit-economics.	0,5	3		8	9
	Topic 6.2. Basic metrics.	0,5	2		8	
	Exam				**18**	**18**

6. Educational technologies

Organization of classes by discipline Project management in the oil and gas industry is carried out according to the following types of academic work: lectures, practical classes.

The implementation of the competence-based approach in the framework of the training area 21.04.01 Oil and gas engineering provides for a combination of contact work with the teacher and extracurricular independent work of students in the educational process for a more complete formation and development of their professional skills.

Lectures are held in a live audience, including using a multimedia projector in the form of an educational presentation. The main points of the lecture sessions are outlined by students, individual topics (parts of topics and sections) are offered for self-study with the obligatory compilation of a summary (checked by the teacher during the current control).

The purpose of practical classes is to master theoretical and practical knowledge in the field of system analysis, as well as the formation of competencies necessary for the effective application of mathematical modeling methods for objects and processes in the oil and gas industry, reflecting the main characteristics of real physical objects. To achieve these goals, we use both traditional-forms of work – problem solving, and interactive methods – group work, analysis of specific situations, business games, etc.

Group work in the analysis of a specific situation develops the ability to analyze and diagnose problems. Using the method of analyzing a specific situation, students develop such qualification qualities as the ability to clearly formulate and express their position, the ability to communicate, discuss, perceive and evaluate information received in verbal form. Practical classes are held in special classrooms equipped with the necessary visual materials.

Independent work covers students ' study of individual issues of the theoretical course.

Independent work is carried out in an individual format based on the teaching materials of the discipline (*appendices2-3*). The level of development of the material on the thoroughly studied question through the course is checked during the current control and certification tests (exam) in the discipline.

7. Educational, methodological and informational support of the discipline

Basic literature:

1. International business in the oil and gas sector: textbook / Edited by Yu. N. Linnik, V. Ya. Afanasyev, and A. S. Kazak. Moscow: INFRA-M Publ., 2016.

2. Meredith J. Smith Project Management: textbook: translated from English. Meredith, S. Jr. Mantel. - St. Petersburg [et al.]: Piter, 2014.

3. Fundamentals of Management (oil and gas industry) : textbook for universities / A. F. Andreev [et al.].-Moscow: Neft i gaz, Publishing House of the Russian State University of Oil and Gas, 2007.

4. Project management: a textbook for universities / V. N. Ostrovskaya [et al.]. -St. Petersburg [et al.]: Lan, 2018.

Additional literature:

1. Jen F. Exploration and production of hydrocarbons: translated from English. Cook, M. Graham. - Moscow: Premium Engineering, Technopress, 2013.

2. Johnston Daniel Analysis of the Economics of Exploration, Risks and Agreements in the International Oil and gas industry. Danieljonston, Moscow: Olimp-Biznes Publ., 2005.

3. Corporate management : a textbook for universities Mazur [et al.], Moscow: Omega-L Publ., 2008.
4. Rose P. R. Risk analysis and management of oil and gas exploration projects. - Moscow Izhevsk: In-t computer. research., 2011.
5. Management of large capital projects: a textbook / V. L. Voevodkin, E. G. Zubarev, S. Yu. Karamyan, O. R. Rykov. - Moscow: OOO "3D-Marketing", 2019. - 184 p.
6. Project Management : a textbook for universities / I. I. Mazur [et al.].-Moscow: Omega-L, 2014.

Periodicals:

1. Neftegazovaya Vertikal magazine http://ngv.ru
2. Gas Industry Magazine http://neftegas.info/gasindustry/
3. Magazines "Neftegaz.ru" http://www.neftegaz.ru

Resources of the Internet information and telecommunications network»:

1. RUDN University EBS and third-party EBS that university students have access to on the basis of concluded contracts:

-RUDN University Electronic Library System-RUDN University Electronic Library System http://lib.rudn.ru/MegaPro/Web

- EBS "University Library online" http://www.biblioclub.ru
- EBS Uritehttp://www.biblio-online.ru
- EBS "Student's consultant" www.studentlibrary.ru
- EBS "Lan" http://e.lanbook.com/

2. Websites of ministries, departments, services, industrial enterprises and companies whose activities are relevant for this discipline:

- Website of the Ministry of Energy of the Russian Federation https://minenergo.gov.ru
- Gazprom PJSC http://www.gazprom.ru
- PJSC LUKOIL http://www.lukoil.ru

3. Databases and search engines:

-electronic fund of legal and regulatory and technical documentation http://docs.cntd.ru/
-Yandex search engine https: / /www.yandex.ru/
- Google search enginehttps://www.google.ru/
- theSCOPUS iterative database http:/ /www.elsevierscience.ru/products/scopus/

Software support:

No

Methodological materials for students ' independent work and study of the discipline (also available in the corresponding section of the discipline in the TUIS RUDN University).):

1. Guidelines for independent work of students in the discipline Project management in the oil and gas industry (*Appendix 2*).

8. Material and technical support of the discipline

Table 5-Material and technical support of the discipline

Audience with a list of material and technical support	Location
Classroom: aud.№360 Set of specialized furniture; chalkboard; technical means: projection screen; SANYO plc xt20 multimedia projector; DEPO Neos 220 system unit	Ul. Podolskoe Shosse, 8k. 5

9. Evaluation Funds Fund

Materials for assessing the level of mastering the educational material of the discipline(evaluation materials), including a list of competencies, specifying stages of their formation, description of the indicators, and criteria of assessment competencies at different stages of their formation, the description of the scales of assessment, typical assignments or other materials necessary for the evaluation of knowledge, skills, and (or) operational experience that characterize the stages' formation of competencies in the process of mastering the educational program, training materials, defining the procedure of assessment of the knowledge, skills, proficiency and (or) operational experience that characterize the stages of competence formation have been developed in full and are available to students, on the discipline page, on the website of the RUDN University (TUIS RUDN).

The program is designed in accordance with the requirements of the RUDN University OS.

Developer:

Teaching assistant of the Department of Subsurface Use and Oil and Gas Engineering		R.V. Khakimov
position	signature	initials, surname

Program Manager

Professor of the Department of Subsurface Use and Oil and Gas Engineering		V.M. Kapustin
position	signature	initials, surname

Director of the Department of Subsurface Use and Oil and Gas Engineering		A.E. Kotelnikov
position	signature	initials, surname

Federal State Autonomous Educational Institution
of Higher Education
«Peoples ' Friendship University of Russia»

Engineering Academy

WORKING PROGRAM OF THE DISCIPLINE

Name of the discipline: Installation of submersible pumps for oil production

Training area: 21.04.01 Oil and gas engineering

Program (focus (profile)): Oil and gas production and transportation technologies

1. Purpose and objectives of the discipline

The purpose of mastering the discipline Installation of submersible pumps for oil production is for students to acquire theoretical knowledge and practical skills in solving complex issues related to the use of equipment in the operation of oil wells. Teaching students about various complications that occur during well operation. General information about submersible pumping units and operational complications. Influence of free gas on the characteristics of submersible centrifugal pumps.

The main **objectives** of the discipline are:
- study of vane pump installation schemes used in oil production;
- studying the characteristics of equipment operation, acquiring skills in choosing a particular equipment;
- mastering the methodology for calculating the characteristics of equipment, well operation technology when using vane pump systems.

2. Place of the discipline in the structure of the educational program

The discipline Installations of submersible vane pumps for oil production belong to the variable part of Block 1 of the curriculum. Its study is based on the material of previous disciplines, and it is also basic for studying subsequent disciplines of the curriculum, the list of which is presented in Table 1.

Table 1-List of previous and subsequent disciplines

n/a number	Previous disciplines	Subsequent disciplines
1	Pressure maintenance systems using multistage vane pumps / Reservoir pressure maintenance systems using multistage vane pumps	Universal method of selection of installations of submersible pumps for oil production / Universal method of selecting submersible station vane pump installations for oil production
2	Dual completion of well for production	Methods of increasing the resource ESP / Methods for increasing the ESP resource
3	Technology and technology of water-gas impact on the reservoir	Output of wells equipped with ESP to the mode / Output of wells, equipped with ESP, to mode
4		Oil production intellectualization / Intellectualization of oil production
5		State final certification

3. List of planned results of training in the discipline, correlated with the planned results of mastering the educational program

The discipline Installation of submersible vane pumps for oil production is aimed at developing the following competencies in students:

- able to evaluate the results of scientific and technical developments, scientific research and justify their own choice, systematizing and summarizing achievements in the oil and gas industry and related fields (OPC-5);

- with the ability to analyze and summarize data on the operation of technological equipment, monitor, provide technical support and manage technological processes in the oil and gas industry (PC-2);

-it is responsible for ensuring safe and efficient operation and operation of technological equipment in the oil and gas industry (PC-3).

The result of training in the discipline is knowledge, skills, abilities and (or) experience of activity that characterize the stages of competence formation and ensure the achievement of the planned results of mastering the educational program, presented in Table 3.

Table 3-Results of training in the discipline, correlated with the planned results of mastering the OPOP in higher education

Competence	**of Knowledge**	**Skills**	**Skills**
1	2	3	4
Ability to evaluate the results of scientific and technical developments, scientific research and justify their own choice, systematizing and summarizing achievements in the oil and gas industry and related fields (OPC-5)	- design of vane pump designs; - theoretical bases of pumping equipment operation in wells; - structures and flow modes of liquid flows in tubing.	- design of well designs for oil production with submersible pump installations	- methods of technological calculation of vane pump parameters ; - methods for calculating pressure distribution curves in tubing and OK.
Ability to analyze and summarize data on the operation of technological equipment, monitor, provide technical support and manage technological processes in the oil and gas industry (PC-2)	- well designs, perforation methods and methods of development of oil and gas wells; - theoretical foundations of fluid lifting from wells; - structures and flow modes of gas-liquid flows in production columns and elevator pipes of oil and gas wells.	- design well structures, submerged equipment layouts	-by methods of technological calculation of well parameters during mechanized production
It is able to ensure safe and efficient operation and operation of technological equipment in the oil and gas industry (PC-3)	- basic methods of mechanized lifting of fluid from wells; - basic design of the main types of deep-pumping and surface equipment of wells.	- demonstrate and correct technological processes during the operation of wells for various purposes; - apply and maintain technological	- methods of designing and selecting equipment for the operation of wells by electric submersible pumping units.

		equipment used in oil production, as well as in the collection and preparation of well products.	

4. Scope of the discipline and types of academic work

Table 3-Scope of the discipline and types of academic work

for full-time education

Type of academic work		Total, hours	Module 4
Classroom classes		32	32
including:			
Lectures (L)		8	8
Practical/seminar sessions (PZ)		24	24
Laboratory work (LR)			
Course project/course work			
Independent work (SRS), including control		76	76
Type of certification test			The exam
Total labor	intensity of academic hours	108	108
	credits	3	3

5. Content of the discipline

Table 4-Content of disciplines and types of classes

for full-time education

n/a number	Name of the section of the discipline / topic of the lesson	Lecture hall .	Pract. / workshop.	Lab.	SRS	Just an hour.
	4 MODULE					
1.	**Section #1. General information about submersible pumping equipment**	**2**	**6**		**10**	**18**
	Topic 1.1. Diagram and main elements of the submersible vane pump installation.	0,5	2		4	6,5
	Topic 1.2. Operating characteristics of a submersible vane pump. Vane pump head, feed rate and speed ratio	1	2		2	5
	Topic 1.3. The main complicating factors in the operation of wells by submersible pumps.	0,5	2		4	6,5
2.	**Section #2. Influence of free gas on the characteristics of submersible vane pumps**	**3**	**8**		**15**	**26**
	Topic 2.1. Parameters that affect the characteristics of submersible vane pumps when pumping GZHS. Installation design, selection of model gas-liquid mixtures, and experimental methods for	0,5	2		4	6,5

n/a number	Name of the section of the discipline / topic of the lesson	Lecture hall .	Pract. / workshop.	Lab.	SRS	Just an hour.
	studying the effect of free gas on pump characteristics.					
	Topic 2.2. Investigation of the effect of gas on the pump performance when operating on model mixtures "water-gas", "water-surfactant-gas" and various receiving pressures.	1	2		4	7
	Topic 2.3. Results of a study of the operation of submersible vane pumpson viscous gas-liquid mixtures "oil-gas".	0,5	2		3	5,5
	Topic 2.4. Method of calculating the characteristics of submersible vane pumps for pumping water and oil and gas mixtures from wells	1	2		4	7
3.	**Section #3. Methods for improving the efficiency of operation of vane pumps for oil**	**production 3**	**10**		**15**	**28**
	Topic 3.1. Depth of the pump under the dynamic fluid level in the well. Adding degassed liquid to the annulus.	0,5	3		3	6,5
	Topic3.2. Using a "conical" pump scheme. Application of pumps with dispersants. Using steps of special structures.	0,5	3		7	10,5
	Topic3.3. Prospects for the use of submersible pumping units	2	4		8	14
	Exam				**36**	**36**

6. Educational technologies

Organization of classes by the discipline Installation of submersible vane pumps for oil production is carried out according to the following types of educational work: lectures, laboratory work, practical exercises.

Implementation of the competency-based approach within the framework of the training area Oil and gas engineering / Technologies of oil and gas production and transportation provides for a combination of contact work with the teacher and extracurricular independent work of students in the educational process for a more complete formation and development of their professional skills.

The lecture is held in a live audience, including using a multimedia projector in the form of an educational presentation. The main points of the lecture sessions are outlined by students, individual topics (parts of topics and sections) are offered for self-study with the obligatory compilation of a summary (checked by the teacher during the current control).

The purpose of practical classes is for students to gain knowledge and develop practical skills in solving complex issues related to the operation of oil and gas wells. To achieve these goals, both traditional forms of work are used – problem solving, working with technological

equipment/specialized software when performing laboratory work, etc., and interactive methods – group work, analysis of specific situations, business game, etc.

Group work when analyzing a specific situation, as well as when performing laboratory work in a subgroup, develops the ability to analyze and diagnose problems. Using the method of analyzing a specific situation, students develop such qualification qualities as the ability to clearly formulate and express their position, the ability to communicate, discuss, perceive and evaluate information received in verbal form. Practical classes and laboratory work are conducted in special classrooms equipped with the necessary visual materials.

Independent work covers students ' study of individual issues of the theoretical course.

Independent work is carried out in an individual format based on the teaching materials of the discipline (*appendices 2-3*). The level of mastering the material on independently studied questions of the course is checked during the current control and certification tests (exam and/or credit).) by discipline.

7. Educational, methodological and informational support of the discipline

Basic literature:

1. Bolsunovskaya L. M. [et al.] Petroleum Engineering. Course book = Oil and gas Engineering. Book for students: a study guide/ edited by L. M. Bolsunovskaya, R. N. Abramova, and I. A. Matveenko. - Electron. dan. Tomsk: TPU Publ., 2014, 742 p.
https://e.lanbook.com/book/62912

2. Tetelmin V. V. Neftegazovoe delo [Oil and gas Engineering]. Training manual / V. V.Tetelmin, V. A. Yazev.-2nd ed.; Dolgoprudny: Publishing House "Intellect", 2014. - 800 p.
http://lib.rudn.ru

3. Tetelmin V. V. Osnovy bureniya na neft i gaz: Uchebnoe posobie [Fundamentals of drilling for oil and gas: A textbook]. Dolgoprudny: Intellekt, 3rd ed., 2014, 296 p.
http://znanium.com/catalog/product/478822

Additional literature:

1. Sayfullin I. Sh.,Tetelmin V. V., Yazev V. A. Fizicheskie osnovy dobycha nefti: Uchebnoe posobie [Physical fundamentals of oil production: A textbook]. Dolgoprudny: Intellekt Publ., 2013, 328 p.
http://znanium.com/catalog/product/423812

2. Arbuzov V. N., Kurganova E. V. Sbornik zadach po tekhnologii dobycheniya neftya i gaza v oslozhnennykh usloviyakh: Practikum: uchebnoe posobie [Collection of problems on oil and gas production technology in complicated conditions]. - Electron. dan. Tomsk: TPU Publ., 2014, 68 p. (in Russian)
https://e.lanbook.com/book/82862

Periodicals:

1. Neftegazovaya Vertikal magazine http://ngv.ru
2. Gas Industry Magazine http://neftegas.info/gasindustry/
3. Magazines "Neftegaz.ru" http://www.neftegaz.ru

Resources of the Internet information and telecommunications network»:

1. RUDN University EBS and third-party EBS that university students have access to on the basis of concluded contracts:

-RUDN University Electronic Library System-RUDN University Electronic Library System http://lib.rudn.ru/MegaPro/Web

- EBS "University Library online" http://www.biblioclub.ru
- EBS Urite http://www.biblio-online.ru
- EBS "Student's consultant" www.studentlibrary.ru
- EBS "Lan" http://e.lanbook.com/

2. Websites of ministries, departments, services, industrial enterprises and companies whose activities are relevant for this discipline:

- Website of the Ministry of Energy of the Russian Federation https://minenergo.gov.ru
- Gazprom PJSC http://www.gazprom.ru
- PJSC LUKOIL http://www.lukoil.ru

3. Databases and search engines:

- electronic fund of legal and regulatory and technical documentation http://docs.cntd.ru/
- Yandex search engine https: / /www.yandex.ru/
- Google search engine https://www.google.ru/
- SCOPUS abstract database http://www.elsevierscience.ru/products/scopus/

Software:

1. Specialized software for conducting lectures and laboratory classes and independent work of students:

- Specialized software "TransasShelf 6000 DrillingSimulator»
- License for ARMARIS software for TESP ESP

Methodological materials for students ' independent work and study of the discipline (also available in the corresponding section of the discipline in the TUIS RUDN University.):

1. Course of lectures on the discipline Installations of submersible vane pumps for oil production (*Appendix 2*).
2. Guidelines for independent work of students in the discipline Installations of submersible vane pumps for oil production (*Appendix 3*).

8. Material and technical support of the discipline

Table 5-Material and technical support of the discipline

Audience with a list of material and technical support	**Location**
Classroom # 333. A set of specialized furniture; technical means: projection screen; NEC V302X multimedia projector; DEPO Neos 220	St system unit. Podolskoe Shosse, 8k. 5
Laboratory of Mining machines room No. 358. Computer with pre-installed licensed software "ARMARIS" Intel processor Soge15, 7 pcs; "Wellhead fittings" - mock-up stand; 3D LED TV on a stand with a screen diagonal of 32	Ul. Podolskoe Shosse, 8k. 5

inches; Mock-up controller "Electon-09 1" from SU "Electon 05-250 " in a compact design	
Laboratory of Mining machines, room No. 362. Set of specialized furniture; Simulator-simulator of drilling "Transas SHELF 6000 Drill"; Additional place of the trainee to the simulator-simulator of drilling "Transas SHELF 6000 Drill"	Ul. Podolskoe Shosse, 8k. 5
Laboratory of Hydrodynamic processes of oil and gas production, room No. 341. Ejector; Working table of the stand, instrumentation and control valves; Tank; Stand-model of the pump-ejector system, left view; Laser diode; Liquid column; Air compressor; Gas supply system to the column; Gas meter; Pressure gauge; Photodiode; Digital oscilloscope.	Ul. Podolskoe Shosse, 8k. 5

9. Evaluation Funds Fund

Materials for assessing the level of mastering the educational material of the discipline(evaluation materials), including a list of competencies, specifying stages of their formation, description of the indicators, and criteria of assessment competencies at different stages of their formation, the description of the scales of assessment, typical assignments or other materials necessary for the evaluation of knowledge, skills, and (or) operational experience that characterize the stages' formation of competencies in the process of mastering the educational program, training materials, defining the procedure of assessment of the knowledge, skills, proficiency and (or) operational experience that characterize the stages of competence formation have been developed in full and are available to students, on the discipline page, on the website of the RUDN University (TUIS RUDN).

The program is designed in accordance with the requirements of the RUDN University OS.

Developer:

Professor of the Department of Subsurface Use and Oil and Gas Engineering		A.N. Drozdov
position	signature	initials, surname
Teaching assistant of the Department of Subsurface Use and Oil and Gas Engineering		Ya.A. Gorbyleva
position	signature	initials, surname

Program Manager

Professor of the Department of Subsurface Use and Oil and Gas Engineering		V.M. Kapustin
position	signature	initials, surname

Director of the Department of Subsurface Use and Oil and Gas Engineering		A.E. Kotelnikov
position	signature	initials, surname

Federal State Autonomous Educational Institution
of Higher Education
«Peoples ' Friendship University of Russia»

Engineering Academy

WORKING PROGRAM OF THE DISCIPLINE

Name of the discipline: Output of wells equipped with ESP to the mode

Training area: 21.04.01 Oil and gas engineering

Program (focus (profile)): Oil and gas production and transportation technologies

1. Purpose and objectives of the discipline

The purpose of mastering the discipline Output of wells equipped with ESP to the mode means that students acquire theoretical knowledge and practical skills in solving complex issues related to the use of equipment when putting wells into operation for further operation. Teaching students about various complications that occur during the well commissioning process. General information about submersible pumping units and additional equipment.

The main **objectives** of the discipline are:
- study of methods and output of a well equipped with a submersible electric centrifugal pump, to the operating mode;
- study of the ESP operation characteristics when the well is put into operation;
- acquisition of skills in choosing a particular equipment;
- mastering the methodology for calculating equipment characteristics.

2. Place of the discipline in the structure of the educational program

Discipline Output of wells equipped with ESP to the mode belongs to the variable part of Block 1 of the curriculum. Its study is based on the material of previous disciplines, and it is also basic for studying subsequent disciplines of the curriculum, the list of which is presented in Table 1.

Table 1-List of previous and subsequent disciplines

n/a number	Previous disciplines	Subsequent disciplines
1	Simultaneously-separate operation of wells	State final certification
2	Reservoir pressure maintenance systems using multi-stage vane pumps	
3	Software package for assessing the reliability of submersible equipment based on operational data	
4	Universal method of selecting submersible vane pump installations for oil	
5	Submersible vane pump installations for oil	
6	Methods for improving the ESP resource	

3. List of planned results of training in the discipline, correlated with the planned results of mastering the educational program

Discipline Putting wells equipped with ESP into operation is aimed at developing thefollowing competencies in students:

- able toevaluate the results of scientific and technical developments, scientific research and justify their own choice, systematizing and summarizing achievements in the oil and gas industry and related fields (OPC-5);

- withthe ability to plan and conduct analytical, simulation and experimental studies, critically evaluate data and draw conclusions (PC-3).

The result of training in the discipline is knowledge, skills, abilities and (or) experience of activity that characterize the stages of competence formation and ensure the achievement of the planned results of mastering the educational program, presented in Table 3.

Table 3-Results of training in the discipline, correlated with the planned results of mastering the OPOP in higher education

Competence	**of Knowledge**	**Skills**	**Skills**
1	2	3	4
the ability to evaluate the results of scientific and technical developments, scientific research and justify their own choices, systematizing and summarizing achievements in the oil and gas industry and other fields (PC-5)	- well designs, perforation methods and methods of development of oil and gas wells; - theoretical foundations of fluid lifting from wells; - structures and flow modes of gas-liquid flows in production columns and elevator pipes of oil and gas wells.	- design a program for setting the well to the mode with the installed ESP.	- methods for technological calculation of well parameters during operation ESP.
the ability to plan and conduct analytical, simulation and experimental studies, critically evaluate data and draw conclusions (PC-3)	- basic methods of mechanized lifting of fluid from wells; - basic design of the main types of deep-pumping and surface equipment of wells.	- demonstrate and correct technological processes during the operation of wells for various purposes; - apply and maintain technological equipment used in oil production.	- methods of designing and selecting equipment for the operation of wells by electric submersible pumping units.

4. Scope of the discipline and types of academic work

Table 3-Scope of the discipline and types of academic work
for full-time education

Type of academic work	Total, hours	Module
		6
Classroom activities	108	108
including:		
Lectures (L)	8	8
Practical/seminar sessions (PZ)	24	24
Laboratory work (LR)		
Course project/course work		
Independent work (SRS), including control	76	76

Type of certification test			Credit with a score
Total labor	intensity of academic hours	108	108
	credits	3	3

5. Content of the discipline

Table 4-Content of discipliness and types of classes
for fulltime education

n/a number	Name of the section of the discipline / topic of the lesson	Lecture hall .	Pract. / workshop.	Lab.	SRS	Just an hour.
	6 Module					
1.	**Section #1. Complete set of ESP**	**2**	**12**		**20**	
	Topic 1.1. Symbol of the ESP. Technical requirements, guidelines for EDS rejection. Monitoring parameters for EDS repair. Revision, entrance control of EDS.	1	6		10	
	Topic 1.2. Submersible electric motor. Technical requirements, guidelines for rejection of submerged electric motors. Control parameters for PAD repair.	1	6		10	
2.	**Section #2. Selection of ESP for well**	**2**	**6**		**10**	
	Topic 2.1. The procedure for selecting ESPs. Selection of ESP. Selection of tubing diameter. Checking the ESP calculation.	2	6		10	
3.	**Section #3. Preparation of the well for operation of its ESP**	**4**	**6**		**19**	
	Topic 3.1. Transfer of the well for repair. Placement of equipment.	1	4		4	
	Topic 3.2. Limits of responsibility and control when preparing a well for operation of its ESP.	1	2		5	
	Topic 3.3. Lifting the ESP from the well. Rise of ESP due to reduced insulation of the cable-motor system.	2	2		10	
	Credit				**27**	**27**

6. Educational technologies

Organization of classes by discipline Output of wells equipped with ESP to the mode is carried out according to the following types of training work: practical exercises/ seminars.

Implementation of the competence-based approach within the framework of the training 21.04.01 " Oil and gas engineering / Technologies of oil and gas production and transportation provides for a combination of contact work with the teacher and

extracurricular independent work of students in the educational process for a more complete formation and development of their professional skills.

Lectures are held in a live audience, including using a multimedia projector in the form of an educational presentation. The main points of the lecture sessions are outlined by students, individual topics (parts of topics and sections) are offered for self-study with the obligatory compilation of a summary (checked by the teacher during the current control).

The purpose of practical classes / seminars is for students to gain knowledge and develop practical skills in solving complex issues related to putting oil wells equipped with ESP into operation. To achieve these goals, both traditional forms of work are used – problem solving, working with technological and socialized materials and documents, while using interactive methods-group work, analysis of specific situations, business game, etc.

Group work when analyzing a specific situation, as well as when performing laboratory work in a subgroup, develops the ability to analyze and diagnose problems. Using the method of analyzing a specific situation, students develop such qualification qualities as the ability to clearly formulate and express their position, the ability to communicate, discuss, perceive and evaluate information received in verbal form. Practical classes are held in special classrooms equipped with the necessary visual materials.

Independent work is carried out in an individual format based on the teaching materials of the discipline (*appendices2-5*). The level of mastering the material on independently studied questions of the course is checked during the current control and certification tests (exam and/or credit).) by discipline.

7. Educational, methodological and informational support of the discipline

Basic literature:

1. Bolsunovskaya L. M. [et al.] Petroleum Engineering. Course book = Oil and gas engineering. Book for students: a study guide/ edited by L. M. Bolsunovskaya, R.N. Abramova, I. A. Matveenko. - Electron. dan. Tomsk: TPU Publ., 2014, 742 p.
https://e.lanbook.com/book/62912

2. Tetelmin V. V. Neftegazovoe delo [Oil and gas engineering]. Training manual / V. V.Tetelmin, V. A. Yazev. - 2nd ed.; Dolgoprudny: Publishing House "Intellect", 2014. - 800 p.
http://lib.rudn.ru

3. Tetelmin V. V. Osnovy bureniya na neft i gaz: Uchebnoe posobie [Fundamentals of drilling for oil and gas: A textbook]. Dolgoprudny: Intellekt, 3rd ed., 2014, 296 p.
http://znanium.com/catalog/product/478822

Additional literature:

1. Sayfullin I. Sh.,Tetelmin V. V., Yazev V. A. Fizicheskie osnovy dobycha nefti: Uchebnoe posobie [Physical fundamentals of oil production: A textbook]. Dolgoprudny: Intellekt Publ., 2013, 328 p.
http://znanium.com/catalog/product/423812

2. Arbuzov V. N. Sbornik zadach po tekhnologii dobycheniya neftya i gaza v oslozhnennykh usloviyakh: Practikum: uchebnoe posobie [Collection of problems on oil and gas production technology in complicated conditions]. Arbuzov, E. V. Kurganova. - Electron. dan. Tomsk: TPU Publ., 2014, 68 p. (in Russian)

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

Periodicals:

1. Neftegazovaya Vertikal magazine http://ngv.ru
2. Gas Industry Magazine http://neftegas.info/gasindustry/
3. Magazines "Neftegaz.ru" http://www.neftegaz.ru

Resources of the Internet information and telecommunications network»:

1. RUDN University EBS and third-party EBS that university students have access to on the basis of concluded contracts:

-RUDN University Electronic Library System-RUDN University Electronic Library System http://lib.rudn.ru/MegaPro/Web

- EBS "University Library online" http://www.biblioclub.ru
- EBS Urite http://www.biblio-online.ru
- EBS "Student's consultant" www.studentlibrary.ru
- EBS "Lan" http://e.lanbook.com/

2. Websites of ministries, departments, services, industrial enterprises and companies whose activities are relevant for this discipline:

- Website of the Ministry of Energy of the Russian Federation https://minenergo.gov.ru
- Gazprom PJSC http://www.gazprom.ru
- PJSC LUKOIL http://www.lukoil.ru

3. Databases and search engines:

- electronic fund of legal and regulatory and technical documentation http://docs.cntd.ru/
- Yandex search engine https: / /www.yandex.ru/
- Google search engine https://www.google.ru/
- SCOPUS abstract database http://www.elsevierscience.ru/products/scopus/

Software:

1. Specialized software for conducting lectures, laboratory and practical classes and independent work of students:

- Specialized software "TransasShelf 6000 DrillingSimulator»
- License for ARMARIS software for TESP ESP

Methodological materials for students ' independent work and study of the discipline (also available in the corresponding section of the discipline in the TUIS RUDN University).):

1. Course of lectures on the disciplineOutput of wells equipped with ESP to the mode (*Appendix 2*).
2. Guidelines for independent work of students in the disciplinePutting wells equipped with ESP into operation (*Appendix 3*).

8. Material and technical support of the discipline

Table 5-Material and technical support of the discipline

Audience with a list of material and technical support	**Location**
Classroom # 333. A set of specialized furniture; technical means: projection screen; NEC V302X multimedia projector; DEPO Neos 220	St system unit. Podolskoe Shosse, 8k. 5
Laboratory of Mining machines room No. 358. Computer with pre-installed licensed software "ARMARIS" Intel processor Soge15, 7 pcs; "Wellhead fittings" - mock-up stand; 3D LED TV on a stand with a screen diagonal of 32 inches; Mock-up controller "Electon-09 1" from SU "Electon 05-250 " in a compact design	Ul. Podolskoe Shosse, 8k. 5
Laboratory of Mining machines, room No. 362. Set of specialized furniture; Simulator-simulator of drilling "Transas SHELF 6000 Drill"; Additional place of the trainee to the simulator-simulator of drilling "Transas SHELF 6000 Drill"	Ul. Podolskoe Shosse, 8k. 5
Laboratory of Hydrodynamic processes of oil and gas production, room No. 341. Ejector; Working table of the stand, instrumentation and control valves; Tank; Stand-model of the pump-ejector system, left view; Laser diode; Liquid column; Air compressor; Gas supply system to the column; Gas meter; Pressure gauge; Photodiode; Digital oscilloscope.	Ul. Podolskoe Shosse, 8k. 5

9. Evaluation Funds Fund

Materials for assessing the level of mastering the educational material of the discipline(evaluation materials), including a list of competencies, specifying stages of their formation, description of the indicators, and criteria of assessment competencies at different stages of their formation, the description of the scales of assessment, typical assignments or other materials necessary for the evaluation of knowledge, skills, and (or) operational experience that characterize the stages' formation of competencies in the process of mastering the educational program, training materials, defining the procedure of assessment of the knowledge, skills, proficiency and (or) operational experience that characterize the stages of competence formation have been developed in full and are available to students, on the discipline page, on the website of the RUDN University (TUIS RUDN).

The program is designed in accordance with the requirements of the RUDN University OS.

Developer:

Professor of the Department of Subsurface Use and Oil and Gas Engineering		A.N. Drozdov
position	signature	initials, surname
Teaching assistant of the Department of Subsurface Use and Oil and Gas Engineering		Ya.A. Gorbyleva
position	signature	initials, surname

Program Manager

Professor of the Department of Subsurface Use and Oil and Gas Engineering		V.M. Kapustin
position	signature	initials, surname

Director of the Department of Subsurface Use and Oil and Gas Engineering		A.E. Kotelnikov
position	signature	initials, surname