


**Ministry of Education and Science of Ukraine  
Dnipro University of Technology**

**GEOLOGICAL SURVEY DEPARTMENT  
DEPARTMENT OF TECHNOLOGY EXPLORATION OF MINERAL  
DEPOSITS**

**“APPROVED”**

Head of Department

Davydenko A.M. 

“ \_\_\_ ” \_\_\_\_\_ 2018

**WORK PROGRAM OF THE ACADEMIC DISCIPLINE**

***“ Operation of drilling equipment ”***

Field of study.....	18 Production and Technology
Specialty.....	185 Oil and Gas Engineering and Technology
Academic degree.....	Bachelor
Academic program.....	Oil and Gas Engineering and Technology
Language of study.....	English

Prolonged: for 20 \_\_\_ / 20\_\_\_ academic year \_\_\_\_\_ ( \_\_\_\_\_ ) " \_\_\_ " \_\_\_ 20\_\_\_.  
(Signature, name, date)

for 20 \_\_\_ / 20\_\_\_ academic year \_\_\_\_\_ ( \_\_\_\_\_ ) " \_\_\_ " \_\_\_ 20\_\_\_.  
(Signature, name, date)

Dnipro  
NTU “DP”  
2018

Work program of the academic discipline “Operation of drilling equipment” for bachelor’s specialty 185 “Oil and Gas Engineering and Technology” / O.A. Pashchenko / NTU “Dnipro Polytechnic” Department of Technology exploration of mineral deposits. - DA: NTU «DP» 2018 - 13 p.

Autors:

Paschenko O.A., assistant professor of engineering exploration of mineral deposits,

The work program regulates:

- key goals and objectives;
- the disciplinary learning outcomes generated through the transformation of the intended learning outcomes of the degree program;
- the content of the discipline formed according to the criterion “disciplinary learning outcomes”;
- the discipline program (thematic plan by different types of classes);
- distribution of the discipline workload by different types of classes;
- an algorithm for assessing the level of achievement of disciplinary learning outcomes (scales, tools, procedures and evaluation criteria);
- criteria and procedures for evaluating the academic achievements of applicants by discipline;
- the contents of the educational and methodological support of the discipline;

The work program is designed to implement a competency approach in planning an education process, delivery of the academic discipline, preparing students for control activities, controlling the implementation of educational activities, internal and external quality assurance in higher education, accreditation of degree programs within the specialty.

## CONTENTS

1 DISCIPLINE OBJECTIVES .....	4
2 INTENDED DISCIPLINARY LEARNING OUTCOMES .....	4
3 BASIC DISCIPLINES .....	4
4 WORKLOAD DISTRIBUTION BY THE FORM OF EDUCATIONAL PROCESS ORGANIZATION AND TYPES OF CLASSES .....	5
5 DISCIPLINE PROGRAM BY TYPES OF CLASSES .....	5
6 KNOWLEDGE PROGRESS TESTING .....	7
6.1 GRADING SCALES .....	7
6.2 DIAGNOSTIC TOOLS AND EVALUATION PROCEDURES.....	7
6.3 EVALUATION CRITERIA .....	9
7 TOOLS, EQUIPMENT, AND SOFTWARE .....	12

## 1 DISCIPLINE OBJECTIVES

In the educational and professional programs of the Dnipro University of Technology specialty 185 “Oil and gas engineering and technology”, the distribution of program learning outcomes (NRN) for the organizational forms of the educational process is done. In particular, the following learning outcomes are attributed to the discipline V1.12 "The operation of drilling equipment":

VR1.7	Provide technical and regulatory software processes of construction of oil and gas wells
VR1.8	organize work for the construction of oil and gas wells while ensuring a high level of performance, safety and minimal cost
VR1.10	Plan components of technological and organizational activities and manage the construction of oil and gas wells

**The objective of discipline** - formation of knowledge for fundamental knowledge and skills of operating drilling equipment.

The implementation of the objective requires transforming program learning outcomes into the disciplinary ones as well as an adequate selection of the contents of the discipline according to this criterion.

## 2 INTENDED DISCIPLINARY LEARNING OUTCOMES

Code NRN	Disciplinary learning outcomes (DRN)	
	DRN code	content
VR1.7	VR1.7-V1.12	know the basics of normative and technical support processes operating drilling equipment
VR1.8	VR1.8-V1.12-1	organization of maintenance, repair, storage and disposal facilities
	VR1.8-V1.12-2	describe basic elements of operation of drilling equipment
	VR1.8-V1.12-3	know technological methods to restore permanent connection surfaces and repaired parts
VR1.10	VR1.10-V1.12	plan components of technological and organizational activities repair and maintenance of equipment for oil and gas

## 3 BASIC DISCIPLINES

Subjects	The acquired learning outcomes
F10 "boring"	calculation and analysis of the major technical and economic indicators drilling
	Methods of designing construction of wells under the terms of the geological section
	Requirements drilling technology using the basic methods
	determine the optimal design of the drill string
	identify effective types of rock cutting tool considering the mechanical properties of rocks
F14 Drilling of wells (oil and gas)	demonstrate the ability drafting elements of technological schemes and devices of technical drilling
	analyze operating modes constituents drilling facility, make optimal range of equipment, perform the optimization of usage by certain criteria
	design technology drilling

Subjects	The acquired learning outcomes
	carry out regulatory and technical support drilling process
	organize work on drilling wells while ensuring a high level of performance, safety and minimal cost
	control drilling using modern methods of data analysis and processing

#### 4 WORKLOAD DISTRIBUTION BY THE FORM OF EDUCATIONAL PROCESS ORGANIZATION AND TYPES OF CLASSES

Type of classes	Workload hours	Distribution by forms of education, <i>hours</i>					
		Full-time		Part-time		Distance	
		Classes (C)	Individual work (IW)	Classes (C)	Individual work (IW)	Classes (C)	Individual work (IW)
Lectures	80	26	54	-	-	6	74
Practical	40	13	27	-	-	4	36
Laboratory	-	-	-	-	-	-	-
Workshops	-	-	-	-	-	-	-
Total	120	39	81	-	-	10	110

#### 5 DISCIPLINE PROGRAM BY TYPES OF CLASSES

Ciphers DRN	Types and topics of training sessions	The volume of components, <i>hours</i>
	<b>LECTURES</b>	<b>80</b>
VR1.7-V1.12	<b>1 Introduction.</b> The concept of the terms "drilling equipment" and "equipment repair", etc. Types of drilling equipment. Service equipment operation and maintenance and repair base Operational documentation	10
VR1.8-V1.12-1 VR1.8-V1.12-2	<b>2 Failures drilling equipment.</b> The causes of equipment failures during operation Indicators of reliability of equipment Processing information on operational failures. Assessment of safety equipment. Support equipment reliability during operation	10
VR1.7-V1.12 VR1.8-V1.12-1 VR1.8-V1.12-2	<b>3 Organization of maintenance, repair, storage and disposal facilities</b> System maintenance equipment. Types and repair equipment Diagnostics of technical condition of equipment. Methods and means of technical diagnostics Technological bases repair equipment Structure of the production process equipment repair The preparatory work for putting equipment repair Washing, cleaning work Dismantling equipment Control and sorting work The assembly equipment Pryrobka and testing of components and machines	10

<b>Ciphers DRN</b>	<b>Types and topics of training sessions</b>	<b>The volume of components, hours</b>
	Coloring equipment	
VR1.8- V1.12-2	<b>4Methods for recovering combinations and surfaces of equipment</b> Classification ways to restore connections Classification of surfaces recovery methods The choice of a rational way of restoration of surfaces	10
VR1.8- V1.12-2	<b>5Designing tank farms</b> Determining the amount of tank farms Select the type tanks. Calculation of vertical cylindrical tanks.	10
VR1.8- V1.12-3	<b>6Technological methods used to repair surfaces and permanent connection of the repaired parts</b> Restoration welding surfaces Recovery metallized surfaces Restoration build-plated surfaces Restoring surfaces of plastic deformation Recovery coated surfaces Restore surface machining Connection details and their individual parts by welding, soldering and bonding	10
VR1.10- V1.12	<b>7The typical process of repair parts.</b> Repair parts such as shafts Repair parts such as bushings Repair parts such as drive (gears, chain sprockets) Repair case details (staniny table and rotor housing swivel valve boxes drilling pumps, valves Fountain shells and pipe fittings, housings turbodrill)	10
VR1.10- V1.12	<b>8Repair and maintenance of equipment for oil and gas.</b> Operation of the column tubing Maintenance and repair of the fountain fittings Maintenance and repair of downhole gas lift systems Maintenance and repair of downhole rod pump equipment Maintenance and repair of downhole centrifugal electric installations Maintenance and repair of electric screw t Operation of pumping units and piping for water injection into the reservoir	10
	<b>PRACTICAL TRAINING</b>	<b>40</b>
VR1.8- V1.12-1	1. Develop an annual plan of maintenance and repair of drilling equipment (TOIR)	5
VR1.8- V1.12-2	2. Develop annual schedule TOIR	5
VR1.8- V1.12-2	3. Calculate the number of working-repairers	5
VR1.8- V1.12-3	4. Calculate the required number of lubricants	5
VR1.10-	5. Map lubrication	5
	6. Maintenance of equipment each change	5

<b>Ciphers DRN</b>	<b>Types and topics of training sessions</b>	<b>The volume of components, hours</b>
V1.12	7. Maintenance number 1 Maintenance number 2 Maintenance number 3	10
<b>INDIVIDUAL WORK</b>		
VR1.8- V1.12-1 VR1.8- V1.12-2 VR1.8- V1.12-3 VR1.10- V1.12	1. Take down machine parts 2. Grease machines 3. Organization of repair services for exploration companies 4. Preparing machine for repair 5. Technological recovery methods of machine parts 6. Tehnolohiya repair parts and components of drilling equipment 7. Extension of exploration equipment	
<b>TOTAL</b>		<b>120</b>

## **6 KNOWLEDGE PROGRESS TESTING**

Certification of student achievement is accomplished through transparent procedures based on objective criteria in accordance with the University Regulations “On Evaluation of Higher Education Applicants' Learning Outcomes”.

The level of competencies achieved in relation to the expectations, identified during the control activities, reflects the real result of the student's study of the discipline.

### **6.1 GRADING SCALES**

Assessment of academic achievement of students of the Dnipro University of Technology is carried out based on a rating (100-point) and institutional grading scales. The latter is necessary (in the official absence of a national scale) to convert (transfer) grades for mobile students.

#### *The scales of assessment of learning outcomes of the NTUDP students*

<b>Rating</b>	<b>Institutional</b>
90 ... 100	Excellent
74 ... 89	Good
60 ... 73	Satisfactory
0 ... 59	Failed

Discipline credits are scored if the student has a final grade of at least 60 points. A lower grade is considered to be an academic debt that is subject to liquidation in accordance with the Regulations on the Organization of the Educational Process of NTUDP.

### **6.2 DIAGNOSTIC TOOLS AND EVALUATION PROCEDURES**

The content of diagnostic tools is aimed at controlling the level of knowledge, skills, communication, autonomy, and responsibility of the student according to the

requirements of the National Qualifications Framework (NQF) up to the 7th qualification level during the demonstration of the learning outcomes regulated by the work program.

During the control activities, the student should perform tasks focused solely on the demonstration of disciplinary learning outcomes (Section 2).

Diagnostic tools provided to students at the control activities in the form of tasks for the intermediate and final knowledge progress testing are formed by specifying the initial data and a way of demonstrating disciplinary learning outcomes.

Diagnostic tools (control tasks) for the intermediate and final knowledge progress testing are approved by the appropriate department.

Type of diagnostic tools and procedures for evaluating the intermediate and final knowledge progress testing are given below.

*Diagnostic and assessment procedures*

INTERMEDIATE CONTROL			FINAL ASSESSMENT	
training sessions	diagnostic tools	procedures	diagnostic tools	procedures
lectures	control tasks for each topic	task during lectures	comprehensive reference work (CCW)	determining the average results of intermediate controls;  CCW performance during the examination at the request of the student
practical	control tasks for each topic	tasks during practical classes		
	or individual task	tasks during independent work		

During the intermediate control, the lectures are evaluated by determining the quality of the performance of the control specific tasks. Practical classes are assessed by the quality of the control or individual task.

If the content of a particular type of teaching activity is subordinated to several descriptors, then the integral value of the assessment may be determined by the weighting coefficients set by the lecturer.

Provided that the level of results of the intermediate controls of all types of training at least 60 points, the final control can be carried out without the student's immediate participation by determining the weighted average value of the obtained grades.

Regardless of the results of the intermediate control, every student during the final knowledge progress testing has the right to perform the CDF, which contains tasks covering key disciplinary learning outcomes.

The number of specific tasks of the CDF should be consistent with the allotted time for completion. The number of CDF options should ensure that the task is individualized.

The value of the mark for the implementation of the CDF is determined by the average evaluation of the components (specific tasks) and is final.



The integral value of the CDF performance assessment can be determined by taking into account the weighting factors established by the department for each NLC descriptor.

### 6.3 EVALUATION CRITERIA

The actual student learning outcomes are identified and measured against what is expected during the control activities using criteria that describe the student's actions to demonstrate the achievement of the learning outcomes.

To evaluate the performance of the control tasks during the intermediate control of lectures and practicals the assimilation factor is used as a criterion, which automatically adapts the indicator to the rating scale:

$$O_i = 100 a / m,$$

where a - number of correct answers or significant operations performed according to the solution standard; m - the total number of questions or substantial operations of the standard.

Individual tasks and complex control works are expertly evaluated using criteria that characterize the ratio of competency requirements and evaluation indicators to a rating scale.

The content of the criteria is based on the competencies identified by the NLC for the Bachelor's level of higher education (given below).

#### **General criteria for achieving learning outcomes 7th qualification for LDCs (BA)**

**Integral competence** is the ability to solve complex problems and specialized practical problems in a particular area of professional activities or in a learning process that involves the use of certain theories and methods of the relevant scientific areas and characterized by complexity and conditions uncertainty.

descriptors NLC	Requirements for knowledge, communication, autonomy and responsibility	Indicator evaluation
<b>Knowledge</b>		
<ul style="list-style-type: none"> <li>◆ Conceptual knowledge acquired during the training and professional activities, including some knowledge of modern achievements;</li> <li>◆ critical understanding of the main theories, principles, methods, and concepts in education and careers</li> </ul>	- A great - proper, reasonable, sensible. Measures the presence of: - conceptual knowledge; - a high degree of state ownership issues; - critical understanding of the main theories, principles, methods and concepts in education and careers	95-100
	A non-gross contains mistakes or errors	90-94
	The answer is correct but has some inaccuracies	85-89
	A correct some inaccuracies but has also proved insufficient	80-84
	The answer is correct but has some inaccuracies, not reasonable and meaningful	74-79
	A fragmentary	70-73
	A student shows a fuzzy idea of the object of study	65-69
	Knowledge minimally satisfactory	60-64
	Knowledge unsatisfactory	<60
<b>Ability</b>		

descriptors NLC	Requirements for knowledge, communication, autonomy and responsibility	Indicator evaluation
<ul style="list-style-type: none"> <li>◆ solving complex problems and unforeseen problems in specialized areas of professional and/or training, which involves the collection and interpretation of information (data), choice of methods and tools, the use of innovative approaches</li> </ul>	<ul style="list-style-type: none"> <li>- The answer describes the ability to:</li> <li>- identify the problem;</li> <li>- formulate hypotheses;</li> <li>- solve problems;</li> <li>- choose adequate methods and tools;</li> <li>- collect and interpret logical and understandable information;</li> <li>- use innovative approaches to solving the problem</li> </ul>	95-100
	The answer describes the ability to apply knowledge in practice with no blunders	90-94
	The answer describes the ability to apply knowledge in practice but has some errors in the implementation of a requirement	85-89
	The answer describes the ability to apply knowledge in practice but has some errors in the implementation of the two requirements	80-84
	The answer describes the ability to apply knowledge in practice but has some errors in the implementation of the three requirements	74-79
	The answer describes the ability to apply knowledge in practice but has some errors in the implementation of the four requirements	70-73
	The answer describes the ability to apply knowledge in practice while performing tasks on the model	65-69
	A characterizes the ability to apply knowledge in performing tasks on the model, but with uncertainties	60-64
	The level of skills is poor	<60
<b>Communication</b>		
<ul style="list-style-type: none"> <li>◆ report to specialists and non-specialists of information, ideas, problems, solutions and their experience in the field of professional activity;</li> <li>◆ the ability to form an effective communication strategy</li> </ul>	<ul style="list-style-type: none"> <li>- Fluent problematic area. Clarity response (report).</li> <li>Language - correct;</li> <li>- - net;</li> <li>- - clear;</li> <li>- - accurate;</li> <li>- - logic;</li> <li>- - expressive;</li> <li>- - concise.</li> <li>Communication strategy:</li> <li>coherent and consistent development of thought;</li> <li>availability of own logical reasoning;</li> <li>relevant arguments and its compliance with the provisions defended;</li> <li>the correct structure of the response (report);</li> <li>correct answers to questions;</li> <li>appropriate equipment to answer questions;</li> <li>the ability to draw conclusions and formulate proposals</li> </ul>	95-100
	Adequate ownership industry issues with minor faults. Sufficient clarity response (report) with minor faults. Appropriate communication strategy with minor faults	90-94
	Good knowledge of the problems of the industry. Good	85-89

descriptors NLC	Requirements for knowledge, communication, autonomy and responsibility	Indicator evaluation
	clarity response (report) and relevant communication strategy (total three requirements are not implemented)	
	Good knowledge of the problems of the industry. Good clarity response (report) and relevant communication strategy (a total of four requirements is not implemented)	80-84
	Good knowledge of the problems of the industry. Good clarity response (report) and relevant communication strategy (total not implemented the five requirements)	74-79
	Satisfactory ownership issues of the industry. Satisfactory clarity response (report) and relevant communication strategy (a total of seven requirements not implemented)	70-73
	Partial ownership issues of the industry. Satisfactory clarity response (report) and communication strategy of faults (total not implemented nine requirements)	65-69
	The fragmented ownership issues of the industry. Satisfactory clarity response (report) and communication strategy of faults (total not implemented 10 requirements)	60-64
	The level of poor communication	<60
<b>Autonomy and responsibility</b>		
<ul style="list-style-type: none"> <li>◆ management actions or complex projects, responsible for decision-making in unpredictable conditions;</li> <li>◆ responsible for the professional development of individuals and/or groups</li> <li>◆ the ability to continue study with a high degree of autonomy</li> </ul>	<ul style="list-style-type: none"> <li>- Excellent individual ownership management competencies focused on:               <ol style="list-style-type: none"> <li>1) management of complex projects, providing:                   <ul style="list-style-type: none"> <li>- exploratory learning activities marked the ability to independently evaluate various life situations, events, facts, detect and defend a personal position;</li> <li>- the ability to work in a team;</li> <li>- control of their own actions;</li> </ul> </li> <li>2) responsibility for decision-making in unpredictable conditions, including:                   <ul style="list-style-type: none"> <li>- justify their decisions the provisions of the regulatory framework of sectoral and national levels;</li> <li>- independence while performing tasks;</li> <li>- lead in discussing problems;</li> <li>- responsibility for the relationship;</li> </ul> </li> <li>3) responsible for the professional development of individuals and/or groups that includes:                   <ul style="list-style-type: none"> <li>- use of vocational-oriented skills;</li> <li>- the use of evidence from independent and correct reasoning;</li> <li>- possession of all kinds of learning activities;</li> </ul> </li> <li>4) the ability to further study with a high degree of autonomy, which provides:                   <ul style="list-style-type: none"> <li>- degree possession of fundamental knowledge;</li> <li>- independent evaluation judgments;</li> <li>- high level of formation of general educational skills;</li> <li>- search and analysis of information resources</li> </ul> </li> </ol> </li> </ul>	95-100
	Confident personality possession competency management (not implemented two requirements)	90-94
	Good knowledge management competencies personality (not implemented three requirements)	85-89

descriptors NLC	Requirements for knowledge, communication, autonomy and responsibility	Indicator evaluation
	Good knowledge management competencies personality (not implemented the four requirements)	80-84
	Good knowledge management competencies personality (not implemented six requirements)	74-79
	Satisfactory ownership of individual competence management (not implemented seven requirements)	70-73
	Satisfactory ownership of individual competence management (not implemented eight claims)	65-69
	The level of autonomy and responsibility fragmented	60-64
	The level of autonomy and responsibility poor	<60

## 7 TOOLS, EQUIPMENT, AND SOFTWARE

Technical training tools via multimedia software.  
Distance learning platform Moodle.

## 8 RECOMMENDED SOURCES

1. Abdumaeв YG, Velyev TK, Jafar SH.T. Installation, operation and repair of equipment and fontанных nahnetatelных wells. - M.: Nedra, 1989. - 246 p.
2. Averbukh BA, Kalashnikov VN Kershenbaum JM, VN Protasov Repair and installation of drilling equipment and neftezhazopromыslovoho. - Moscow: Nedra, 1976. -368 p.
3. Babayev SG Neftepromыslovoho reliability of equipment. - Moscow: Nedra, 1997. - 264 p.
4. Buhalenko EI, UG Abdullaev Installation, maintenance and repair of equipment neftepromыslovoho. - M.: Nedra, 1985. - 391 p.
5. Gusev AS, AL Karunyn., IN Kramskoy., Starodubtseva SA Reliability of mechanical systems and structures in sluchayных impact. - M.: MSTU "us", 2000. - 284 p.
6. Y. Zaitsev, RA Maksutov., OV Chubanov and others. Reference for posobyе hazlyftnomu mode of operation of wells. - M.: Nedra, 1984. - 360 p.
7. Kurchatkyn VV Telnykov NF, Achkasov KA et al. and reliability of repairs cars. - M.: Kolos, 2000. - 776 p.
8. Protasov VN Polymer pavement neftepromыslovoho equipment: Reference posobyе. - M.: Nedra, 1994. - 219 p.
9. Protasov VN BZ Sultanov, SV Krivenkov. Operation of equipment for drilling wells and neftezhazodobyчы. - M.: Nedra, 2004. - 686 p.
10. Dudley, MA Diagnosis and design of drilling Machinery Training. manual. Dudley MA Meshcheryakov LI - Dnipropetrovsk National Mining University, 2004. - 448 p.

Educational edition

WORK PROGRAM OF THE ACADEMIC DISCIPLINE  
“Operation of drilling equipment”  
185 “Oil and gas engineering and technology”

Prepared for publication  
Dnipro University of Technology.  
Certificate of registration in the State Register, control number 1842  
49005, Dnipro, Dmytro Yavornytskoho Ave. 19