Ministry of Education and Science of Ukraine
Dnipro University of Technology

MINING FACULTY

DEPARTMENT OF TRANSPORT SYSTEMS AND TECHNOLOGIES

"APPROVED"
Head of Department
Shirin L.N. _____
"____" _____ 2018

WORK PROGRAM OF THE ACADEMIC DISCIPLINE

" Fundamentals diagnosis transport systems "

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 “Fundamentals diagnosis transport systems” for bachelor’s specialty 185 “Oil and Gas Engineering and Technology” / Koptovets AM / NTU “Dnipro Polytechnic” Department of transport systems and technologies. - DA: NTU «DP» 2018 - 13 p.

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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

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 V2.16 "Fundamentals diagnosis transport systems ":

VR2.3	Calculate and adjust the modes of hazonaftopostachannya for different operating conditions
VR2.4	Use practical methods of diagnosis of disability hazonaftopostachannya
VR2.5	To ensure the safety components of hazonaftopostachannya according to operating rules
VR2.6	Assess the quality and restore the properties of the elements of the gas oil supply for specific conditions
VR2.7	Provide regulatory and technical support for the creation, operation and recovery systems and technologies for transportation and storage of hydrocarbons

The objective of discipline - formation of competencies on research methods of physical processes that accompany the work of transport systems to establish diagnostic features and determining the technical condition of the facilities and research equipment technical condition nondestructive methods and systems of control of.

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
VR2.3	VR2.3-V2.16	Provide management information and material flows in the freight traffic intensive industries
VR2.4	VR2.4-V2.16	Use practical methods of diagnosis efficiency of transport systems
VR2.5	VR2.5-V2.16	Own terms, concepts, definitions and performance diagnostics
VR2.6	VR2.6-V1.16	Classify methods of diagnosis.Restore quality transport cars
VR2.7	VR2.7-V1.16	Elect controlled parameters and methods of diagnosing technical systems

3 BASIC DISCIPLINES

Subjects	The acquired learning outcomes
B2 Chemistry	know the properties of hydrocarbons and their composition
B3 Physics	know the basic laws of state gas
Introduction to F1	maintain and increase moral, cultural, scientific achievements and values of society by understanding the history and patterns of development oil and GasIts place in the overall system knowledge about nature and society and the development of society, technology and technology
	communicate with other professional groups at different levels (with experts from other disciplines / economic activities)
	know the overall structure, relationships and functionality of

Subjects	The acquired learning outcomes
	individual elements of the system of Ukraine hydrocarbons
F6 Hydraulics	characterized regimes of fluid flow through pipes
	know the basic elements of hydraulic circuits, technical devices and their pictograms
F7 Thermodynamics and Heat Transfer	own methods of determining the thermal properties of liquids and gas mixtures
F13Fundamentals of transport and storage of hydrocarbons	characterized by major transport crude oil, petroleum and gas
	know the basics elements of technological schemes and technical equipment of transport and storage of oil and gas
V2.1 Metrology, Standardization and Certification	apply the basic methods of analysis and assessment of the state oil and gas facilities elements of technical diagnostics in industrial and laboratory conditions
V2.10 operation of gas-oil supply	make payments regimes hazonaftopostachannya of systems for different operating conditions
	apply diagnostic methods of performance systems hazonaftopostachannya
	taking measures to ensure Security systems components hazonaftopostachannya according to operating rules
	provide quality and restore the properties of the elements of hazonaftopostachannya specific conditions
	taking measures to ensure adequate bandwidth links of hazonaftopostachannya
	own modern methods of data analysis and processing for controlling the operation of hazonaftopostachannya

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

Type of classes	Workload hours	Distribution by forms of education, *hours*					
		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, *hours*
	Lectures	**80**
VR2.7-V1.16 VR2.4-V2.16	**1. Aim, subject and object diagnostics. Tasks diagnosis**	4
	The use of technical diagnostics.	
	The aim, object, object and subject of diagnosis	
	Tasks diagnosis.	
	2. Terms, concepts, definitions and performance diagnostics	4
	Technical diagnosis.	

	The technical condition of the object.	
	Technical diagnostic algorithm.	
	Parameter state.	
	Diagnostic model.	
	Means technical diagnostics.	
	The technical diagnosis.	
	Self Diagnosis	
	3. Diagnostic parameters	4
	Appointment diagnostic parameter.	
	Lines diagnostic parameters.	
	The task of selecting diagnostic parameter.	
	Appointment of operational diagnostic parameters.	
VR2.3-V2.16 VR2.4-V2.16	**4. The relationship of structural and diagnostic parameters**	4
	Parameters output workflows.	
	Parameters related processes.	
	The structural parameters.	
	Types of relationship of structural and diagnostic parameters.	
VR2.4-V2.16 VR2.5-V2.16 VR2.6-V2.16	**5. Dependence of change diagnostic parameters of achievements**	4
	The uniqueness of the diagnostic parameter.	
	Stability diagnostic parameter.	
	The sensitivity of the diagnostic parameter.	
	Informative diagnostic parameter.	
VR2.3-V2.16 VR2.4-V2.16 VR2.5-V2.16 VR2.6-V2.16	**6. Characteristics of diagnostic parameters. Types and methods of determining the standard diagnostic parameters**	4
	Groups of state parameters.	
	Resource and operating parameters.	
	Characteristic signs and diagnostic parameters.	
	Diagnostic standards.	
VR2.4-V2.16 VR2.5-V2.16 VR2.6-V2.16	**7. Classification methods of diagnosing**	4
	Experimental method of diagnosis.	
	Measuring method of diagnosis.	
	Physical methods of diagnosis.	
	8. Intellectual methods of diagnosing	4
	Listening.	
	Review.	
	Check and touch obonyannyam.	
	Theoretical study.	
	Heuristic method of investigation.	
	9. Instrumental methods of diagnosis	4
	Direct and indirect methods of diagnosis.	
	Diagnosis for workflow options.	
	Diagnosis on parameters related processes.	
	Diagnosis for structural parameters.	
	Energy and statodynamichni methods of diagnosis.	
	Optical methods of diagnosing	
	10. Diagnosis of Technical Systems	4
	Classification of technical diagnostics.	
	Types of Diagnosis.	

	11. The choice of monitoring parameters and methods of diagnosing technical systems	4
	Selection of monitored parameters.	
	The method of finding of factors influence.	
	The method of factor analysis.	
	Mathematical modeling.	
	The method of expert evaluations.	
	12. Hardware diagnostic methods of technical systems	4
	Method tolerance control and diagnostics.	
	Method comparison with the standard.	
	Method majority control and diagnostics.	
	The method of monitoring and diagnostics with the use of correcting codes.	
	13. Tasks and types of knowledge in building diagnostic models	4
	Basic diagnostic problem.	
	Knowledge of the typical defects of their direct and indirect indicators.	
	Knowledge of the structural organization of diagnosing object.	
	Knowledge of standard and possible diagnostic parameters.	
	14. Types of diagnostic models	4
	The types of models.	
	Continuous diagnostic model.	
	Discrete diagnostic model.	
	Special diagnostic model.	
	Classification of diagnostic models.	
VR2.3-V2.16	**15. Functional diagnostics and information modeling**	4
	Information models.	
	Functional logic model	
VR2.3-V2.16 VR2.4-V2.16	**16. The logical and mathematical modeling diagnosis**	4
	Logical modeling diagnosis.	
	Mathematical modeling of diagnostics.	
	Construction of mathematical models.	
	Analytical models of diagnosis.	
	17. Probabilistic and deterministic model for constructing decision rules	4
	The method of probabilistic forecasting.	
	Deterministic approaches.	
	Tolerance method.	
	18. Statistical methods consistent recognition of technical condition.	4
	Diagnostic matrix	
	Bayes Method.	
	Method Wald.	
	Diagnostic matrix.	
	Scheme diagnostic matrix.	
VR2.3-V2.16 VR2.4-V2.16 VR2.5-	**19. Diagnosis of transport systems to deliver, design and purpose equipment**	8
	The main fault system	
	Sudden and parametric refuse	
	The parameters and methods for diagnosing;	

V2.16 VR2.6- V2.16	Diagnostic options	
	Diagnostic features and faults	
	Control and diagnostics on regulatory requirements	
	Evaluation of technical condition	
	Parameters control and regulation systems	
	PRACTICAL TRAINING	**40**
VR2.3- V2.16 VR2.4- V2.16 VR2.5- V2.16 VR2.6- V2.16	1. Definition of the technical state of the object	8
	2. Development of technical diagnostic algorithm	8
	3. Construction of a mathematical model of diagnosis	8
	4. Construction diagnostic matrix	8
	5. Logical modeling diagnosis	8
	TOTAL	**120**

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

Rating	Institutional
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

<table>
<tr><th colspan="3">INTERMEDIATE CONTROL</th><th colspan="2">FINAL ASSESSMENT</th></tr>
<tr><th>training sessions</th><th>diagnostic tools</th><th>procedures</th><th>diagnostic tools</th><th>procedures</th></tr>
<tr><td>lectures</td><td>control tasks for each topic</td><td>task during lectures</td><td rowspan="3">comprehensive reference work (CCW)</td><td rowspan="3">determining the average results of intermediate controls;

CCW performance during the examination at the request of the student</td></tr>
<tr><td rowspan="2">practical</td><td>control tasks for each topic</td><td>tasks during practical classes</td></tr>
<tr><td>or individual task</td><td>tasks during independent work</td></tr>
</table>

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
Knowledge		
♦ Conceptual knowledge acquired during the training and professional activities, including some knowledge of modern achievements; ♦ critical understanding of the main theories, principles, methods, and concepts in education and careers	- 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
Ability		

descriptors NLC	Requirements for knowledge, communication, autonomy and responsibility	Indicator evaluation
♦ 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	- The answer describes the ability to: - identify the problem; - formulate hypotheses; - solve problems; - choose adequate methods and tools; - collect and interpret logical and understandable information; - use innovative approaches to solving the problem	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
Communication		
♦ report to specialists and non-specialists of information, ideas, problems, solutions and their experience in the field of professional activity; ♦ the ability to form an effective communication strategy	- Fluent problematic area. Clarity response (report). Language - correct; - - net; - - clear; - - accurate; - - logic; - - expressive; - - concise. Communication strategy: coherent and consistent development of thought; availability of own logical reasoning; relevant arguments and its compliance with the provisions defended; the correct structure of the response (report); correct answers to questions; appropriate equipment to answer questions; the ability to draw conclusions and formulate proposals	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
Autonomy and responsibility		
♦ management actions or complex projects, responsible for decision-making in unpredictable conditions; ♦ responsible for the professional development of individuals and/or groups ♦ the ability to continue study with a high degree of autonomy	- Excellent individual ownership management competencies focused on: 1) management of complex projects, providing: - exploratory learning activities marked the ability to independently evaluate various life situations, events, facts, detect and defend a personal position; - the ability to work in a team; - control of their own actions; 2) responsibility for decision-making in unpredictable conditions, including: - justify their decisions the provisions of the regulatory framework of sectoral and national levels; - independence while performing tasks; - lead in discussing problems; - responsibility for the relationship; 3) responsible for the professional development of individuals and/or groups that includes: - use of vocational-oriented skills; - the use of evidence from independent and correct reasoning; - possession of all kinds of learning activities; 4) the ability to further study with a high degree of autonomy, which provides: - degree possession of fundamental knowledge; - independent evaluation judgments; - high level of formation of general educational skills; - search and analysis of information resources	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.Hrutskyy AV Tehnycheskaya diagnostics. - St. Petersburg: MTU, 2005. - 207 p.

2. Glazkov VF Fundamentals of theory and reliability of diagnosis. - St. Petersburg: SPbHASU, 2006. - 103 p.

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4. EG Pereverznev Of technical reliability of systems. - Dnepropetrovsk, Thresholds, 2002. - 396 p.

5. Wentzel ES, Ovcharov LA Probability Theory and Inzhenernyi EE applications. - M .: Nauka, 1988. - 240 p.

6. PP Parkhomenko Fundamentals Tehnicheskoe diagnosis. In 2 books. Book. 1. Model objects, methods and algorithms diagnosis. - M .: Energy, 1976. - 464 p.

7. Parkhomenko, PP, ES Sahomonyan Fundamentals Tehnicheskoe diagnosis. Kn.2. Optimization algorithms dyahnostyrovanyya, apparaturnыe means. - M .: Energy, 1981. - 320 p.

8. Safarbakov AM, Lukyanov AV, SV Pakhomov Fundamentals Tehnicheskoe diagnosis. - Irkutsk: YrHUPS, 2006. - 216 p.

9.Reference gas transportation company employee / V. Rozhonyuk, AA Rudnik, VM Kolomyeyev and others. - Kyiv Rostock, 2001. - 1092 p.

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