MINING INSTITUTE

DEPARTMENT OF ECOLOGY AND ENVIRONMENTAL PROTECTION TECHNOLOGY

"APPROVED"
Head of Department

Pavlichenko A.V. _____

"____" _____ 2018

WORK PROGRAM OF THE ACADEMIC DISCIPLINE

" Technical Ecology "

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 "Technical Ecology" for bachelor's specialty 185 "Oil and Gas Engineering and Technology" / NTU "Dnipro Polytechnic" Department of Ecology And Environmental 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 V2.2 "Technical Ecology»:

PR13	Plan and organize the work of the structural unit of oil and gas company in accordance with the requirements of life safety, occupational safety and environmental protection
PR21	Create items production technology, transportation and storage of carbohydrate energy

The objective of discipline - formation of future specialists (Bachelors) skills and competencies to assess the impact of the main types of modern productions on components of the environment with a comprehensive forecast of the environmental consequences and justification of appropriate methods of purification of gas and dust emissions and waste water, recovery methods of man-made landscapes, the introduction of alternative technologies and cleaner production.

Tasks of the course include building knowledge about the sources of pollution of the biosphere components from various industrial productions and processes, quantitative and qualitative characteristics of pollutants; the ability to assess the environmental impact of the basic processes of mining, processing, metallurgical, oil, chemical industry, energy, transport, agriculture, etc., and justify conservation measures to improve the environment.

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**
PR13 PR21	PR21.1-V2.2	The ability to explain scientifically the phenomenon, the processes occurring in clearing gas emissions in the atmosphere, hydrosphere in wastewater and solid waste in the lithosphere
	PR21.2-V2.2	Choosing the right method and the method of cleaning the atmosphere, hydrosphere, lithosphere at the release and discharge of industrial waste in them
	PR21.3-V2.2	Evaluate basic parameters of physical and chemical environmental processes
	PR21.4-V2.2	To be able to select and obchyslyaty parameters of certain types of equipment, technology and environmental protection technologies
	PR21.5-V2.2	To be able to predict the potential environmental impact of existing technologies for mining and processing of mineral resources, using knowledge of physical and chemical properties of pollutants, processes parameters and indicators of environmental regulations
	PR21.6-V2.2	Justify the expediency of engineering methods of wastewater treatment and gas and dust emissions

Code NRN	Disciplinary learning outcomes (DRN)	
	DRN code	content
	PR21.7-V2.2	To be able to search the latest technical and technological and organizational solutions to implementation in production of advanced environmental developments and modern equipment in the field of environmental protection
	PR21.8-V2.2	To analyze ways of improving existing environmental and pryrodovidnovlyuvanyh technologies in mining, metallurgical and chemical plants according to the standards of environmental safety areas and state

3 BASIC DISCIPLINES

Subjects	The acquired learning outcomes
B2 Chemistry	To demonstrate the application of basic concepts, the basic laws of physics and chemistry for forecasting and analysis of physical and chemical properties of oil, condensate and natural gas in their production, drilling, transportation and storage.
B4 Fizyka1	To apply mathematical methods to determine the specific values of process parameters gas wells, preparation of oil and gas industry and main gas, hazonaftoshovysch other system elements hazonaftopostachannya.
	To demonstrate the application of basic concepts, the basic laws of physics and chemistry for forecasting and analysis of physical and chemical properties of oil, condensate and natural gas in their production, drilling, transportation and storage.
B1 Matematyka1	Demonstrate the ability to apply the basic methods of analysis and assessment of the state oil and gas facilities elements of technical diagnostics in industrial and laboratory conditions.
	To apply mathematical methods to determine the specific values of process parameters gas wells, preparation of oil and gas industry and main gas, hazonaftoshovysch other system elements 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)
lecture	90	26	64	-	-	8	82
practical	30	13	17	-	-	4	26
laboratory	-	-	-	-	-	-	-
workshops	-	-	-	-	-	-	-
TOGETHER	120	39	81	-	-	12	108

5 DISCIPLINE PROGRAM BY TYPES OF CLASSES

Ciphers DRN	Types and topics of training sessions	The volume of components, *hours*
	LECTURES	**90**
PR21.1-V2.2	1. Technical Ecology as environmental compliance, and subject matter of the problem. The structure and composition of the membranes of the biosphere, atmosphere, hydrosphere and lithosphere. Problems associated with pollution of the biosphere as a result of human activity human	12
PR21.3-V2.2	2. The impact of mining on the environment, production technology and forms of abuse of the environment in the development of mineral deposits open and underground mining	14
PR21.1-V2.2 PR21.3-V2.2	3. The problem of waste production in mining industry. Mineralized mine water problem and how to fix it. Dumps, sludge ponds, tailings. The impact of man-made objects in the environment. The problem of flooding in the areas of mining regions. Environmental measures to eliminate the negative environmental effects caused by the mining industry. Revegetation of disturbed lands, technical and biological stages	10
PR21.2-PR21.4 V2.2, V2.2, V2.2 PR21.5	4. Metallurgy factor as a powerful negative impact on the environment, technology blast furnace pig iron, steel industry, processes electrometallurgy. Purification of process gases from gaseous mixtures at steel production	8
PR21.5-V2.2	5. The combined effects of energy facilities on the environment: hydroelectric power, thermal power plants, nuclear power plants. The principle of thermal, nuclear and hydroelectric. Comparative assessment of environmental impacts of hydropower plants, thermal power plants, nuclear power plants on the environment	12
PR21.5-V2.2	6. Impact of transport on the environment. Physico-chemical composition of emissions from mobile sources	6
PR21.5-V2.2	7. The impact of agriculture on the biosphere. Problems hydrosphere pollution from the use of pesticides and organic fertilizers	6
PR21.4-V2.2	8. Alternative energy sources and perspectives of their implementation in Ukraine. Solar power. The main uses of solar energy. Wind energy. Advantages and disadvantages of wind energy. Bioenergy. Advantages and disadvantages of using bioenergy. Methane tanks	6
PR21.2-V2.2 PR21.4-V2.2	9. Modern technologies of air protection, water protection, restoration of contaminated and disturbed lands	16
	PRACTICAL TRAINING	**30**
PR21.3-V2.2	Inventory of emission sources	3
PR21.5-V2.2 PR21.7-V2.2	Calculation of pollutants in air traffic used by business entities and privately owned public.	4
PR21.5-V2.2	Calculation and evaluation of soil contamination along the road	4

Ciphers DRN	Types and topics of training sessions	The volume of components, *hours*
PR21.6-V2.2	Calculation and evaluation runoff from road	4
	Calculation of toxic emissions when operating vehicles	4
	Calculation of pollutant emissions from vehicles in the territory Parking	4
	Calculation of emissions into the atmosphere during combustion of free oil and oil products	4
PR21.8-V2.2	Estimation of physical and mechanical structure of fine substances in water reservoirs	3
	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

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;
practical	control tasks for each topic	tasks during practical classes		
	or individual task	tasks during independent work		CCW performance during the examination at the request of the student

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		
♦ solving complex problems and unforeseen problems in specialized areas of	⁃ The answer describes the ability to: - identify the problem; - formulate hypotheses; - solve problems;	95-100

descriptors NLC	Requirements for knowledge, communication, autonomy and responsibility	Indicator evaluation
professional and/or training, which involves the collection and interpretation of information (data), choice of methods and tools, the use of innovative approaches	- choose adequate methods and tools; - collect and interpret logical and understandable information; - use innovative approaches to solving the problem	
	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 clarity response (report) and relevant communication strategy (total three requirements are not implemented)	85-89
	Good knowledge of the problems of the industry. Good clarity response (report) and relevant communication	80-84

descriptors NLC	Requirements for knowledge, communication, autonomy and responsibility	Indicator evaluation
	strategy (a total of four requirements is not implemented)	
	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
	Good knowledge management competencies personality (not implemented the four requirements)	80-84
	Good knowledge management competencies personality (not implemented six requirements)	74-79

descriptors NLC	Requirements for knowledge, communication, autonomy and responsibility	Indicator evaluation
	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   Draft standard higher education Bachelor of Science with 185 specialty "Oil and gas engineering and technology." ECS 2016: Type. The Ministry of Education and Science of Ukraine number 375 of 06/04/2016 p. - K .: Education of Ukraine, 2016. - 20 p.

2   User Guide ECTS [electronic resource]. URL:**http: //mdu.in.ua/Ucheb/dovidnik_ koristuvacha_ ekts.pdf** (Date of appeal: 04/11/2017).

3   Law of Ukraine "On Higher Education" [Electronic resource]. URL:**http://zakon2.rada.gov.ua** / Laws / show / 1556-18 (appeal date: 11.04.2017).

4   The Law of Ukraine "On Education" [electronic resource]. URL:**http://zakon3.rada.gov.ua/ laws / show / 2145-19** (Date of appeal: 04/11/2017).

5   Letter of the Ministry of Education and Science of Ukraine of 28.04.2017 number 1 / 9-239 for the use in the higher education sample designs educational programs.

6   Ministry of Education and Science of Ukraine "01" June 2017 edition number 600 of the Ministry of Education and Science of Ukraine "21" December 2017 number 1648.

7   NQF. **http://zakon3.rada.gov.ua/laws/** show / 1341-2011-Mr.

8   Draft standard higher education Bachelor of Science with a specialty 183 "environmental technologies". ECS 2016. - K .: Education of Ukraine, 2016. - 13 p.

9   State higher education institutions "NSU" Designing educational process approved by the Academic Council of 11.15.2016, Minutes № 15. URL: **http://www.nmu.org.ua/ua/content/infrastructure/structural_divisions**/ Educ_ department / docs / (date of appeal: 11/04/2017).

10 Cabinet of Ministers of Ukraine of 30 December 2015 г. 1187 number "Licensing conditions for educational activities of educational institutions" (as amended by the Cabinet of Ministers of Ukraine of 10 May 2018 г. Number 347) [electronic resource]. URL: http://zakon5.rada.gov.ua/laws/show/347-2018-п (date of appeal: 08/04/2018).

11 Recommendations to the structure and content of the work program of the discipline. Annex 2 to the letter of Ukraine from 9.07.2018 №1 / 9-434.

12 Standards and Guidelines for Quality Assurance European educational space. URL:**http://www.britishcouncil.org.ua/sites/default/files/ standards-and-guidelines_for_qa_in_the_ehea_2015.pdf** (Date of appeal: 04/11/2017).

Background

1. State standards of Ukraine: Environmental Management System: ISO ISO 14001-97, GOST ISO 14004-97. Guidelines for the implementation of environmental audits, ISO ISO 14010-97, GOST ISO 14011-97, GOST ISO 14012-97.- Official Publication. - K: State Standard of Ukraine, 1998.-226 p.

2. Zubyk SV Technical Ecology: Sources of pollution and environmental protection. - Lviv: New Oriyana, 2007. - 432 p.

3. Antoshkin LI, NN Belyaev, Gun'ko EY comments эколohycheskoho line with опасными accident with chemical substances., Dnepropetrovsk, Science and Education, 2008. - 132 p.

4. National report on drinking water quality and the state of water supplies in Ukraine in 2017 Ministry of Housing. Kyiv, 2016 - 710 p.

5. National Report on the State of Environment in Ukraine in 2016 / M-of Environmental Protection of Ukraine. - BN - 301 p.

6. Backa MT, Pyrskyy AA, GM Ryzhov Investigation of quarries for extraction of construction materials on the atmosphere and Earth's surface: Teach. manual / Zhytomyr State. tehnolohich. Univ., Zhitomir: ZSTU 2003. - 110 p.

7. Backa MT, Doroschenko V. Sewage treatment plants and devices: Training. manual / Zhytomyr State. Technological University. - Zhytomyr, 2005. - 180 p.

8. Soluha BV, Fuchs GB Urban Ecology: Textbook. manual / Kyiv nats.un-t Engineering and Architecture. - K., 2003. - 337 p.

9. AN Golitsyno MONITORING Promышlennaya ecology and environment pollution pryrodnoy: Textbook. - M .: Oniks, 2007. - 336 p.

10. Road Transport Ecology: Textbook / YF Gutarevych, DV Zerkalov, AG Talker and others.- C .: Base, 2002. - 312 p.

11. Klimenko LP Technical Ecology: Textbook for universities. Tutorial.- Mykolaiv: Printed at NaUKMA, 2000. - 304 p.

Information resources

1. http://zakon4.rada.gov.ua — Official site of the Verkhovna Rada of Ukraine

2. http://www.mon.gov.ua — The official website of the Ministry of Education and Science Ukraine

3. http://www.menr.gov.ua — The official website of the Ministry of Ecology and Natural Resources of Ukraine

4. http://www.docload.ru — Free library standards and regulations

5. www.irbis-nbuv.gov.ua — Scientific Periodicals of Ukraine. Library. Vernadsky

6. http://eco-profi.info — Information resources, posvyaschennыy Waste Handling production and consumption

7. http://sop.org.ua — Nature Conservation service - Info Center

8. http://env.teset.sumdu.edu.ua — Research Center for Applied Environmental Research

WORK PROGRAM OF THE ACADEMIC DISCIPLINE
"Technical Ecology"
185 "Oil and gas engineering and technology"