Ministry of Education and Science of Ukraine
Dnipro University of Technology

Department of Physics

"APPROVED"
Head of Department
Igor Garkusha _____
« 31 » August 2020 year

WORK PROGRAM OF THE ACADEMIC DISCIPLINE

" Physics "

Field of study…….....	19 Architecture and construction
Specialty.....	192 Construction and Civil Engeneering
Academic degree.....	Bachelor
Academic program.....	192 Construction and Civil Engeneering
Type of discipline.....	Basic
Total workload……..	8 credits (240 hours)
Type of final assessment.....	exam
Period of study.....	second and third semesters.
Language of study.....	English

Lecturer: Mendel Pevzner

Prolonged: for 20 __ / 20__ academic year _____ (_____) "__" ___ 20__.
(Signature, name, date)

for 20 __ / 20__ academic year _____ (_____) "__" ___ 20__.
(Signature, name, date)

Dnipro
NTU "DP"
2020

Work program of the academic discipline “Physics” for bachelor’s specialty 192 Construction and Civil Engeneering / M. Sh. Pevzner / NTU “Dnipro Polytechnic” Department of Physics. - DA: NTU «DP» 2020 - 13 p.

Author - M. Sh. Pevzner, prof. of the dept. of Physics

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.

Approved by the decision of the Methodical Commission of specialty 192 Construction and Civil Engeneering (protocol №7 від 26.06.2020 р).

CONTENTS

1 DISCIPLINE OBJECTIVES

In the educational and professional programs of the Dnipro University of Technology specialty 192 Construction and Civil Engeneering, 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 B2 " Physics ":

PH9	Applying the basic theories, methods and principles of natural sciences.
PH12	Use modern building materials, products and structures in the design and construction of construction projects depending on the technology of their manufacture and technical characteristics.

The objective of discipline – formation of competencies for the use of the laws of classical and modern physics in the practice in the training of bachelors in the specialty 192 Construction and Civil Engineering.

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**
PH9	PH9.1-Б2	know the basic physical quantities and characteristics, the relationships between them, their units
	PH9.2-Б2	formulate physical ideas, solve problems, make estimates of quantities, operate with physical models and understand the limits of their applications
	PH9.3-Б2	use the laws of dynamics and conservation laws to solve professional problems
	PH9.4-Б2	apply knowledge of the basic fundamental laws of classical and modern physics to solve environmental problems

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Code NRN	Disciplinary learning outcomes (DRN)	
	DRN code	**content**
	PH9-4	apply knowledge of the basic fundamental laws of classical and modern physics to solve environmental problems
PH12	PH12-1	know the physical phenomena that form the physical basis of technological processes. Have the skills to use physical methods in the experimental study of the properties of materials, mathematical processing of experimental results
	PH12-2	formation of skills of physical modeling of applied tasks of the future specialty

3 BASIC DISCIPLINES

Subjects	The acquired learning outcomes
Б1 Higher mathematics	Know the basic concepts of vector algebra, the concepts of derivative (including partial), primitive, definite integral and integral along lines and surfaces, the theory of power series and Fourier series, differential equations and probability theory.
	Be able to perform algebraic operations on vectors, calculate derivatives, initial definite integrals for elementary functions, perform expansion of elementary functions to a power series, solve the simplest differential equations

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	160	64	96	-	-	16	144
laboratory	80	32	48	-	-	8	72
TOTAL	240	96	144	-	-	24	216

5 DISCIPLINE PROGRAM BY TYPES OF CLASSES

Шифри ДРН	2	Обсяг складових, *години*
	ЛЕКЦІЇ	**160**
PH9-1, PH9-2, PH9-3, PH12-1	**1 Physical foundations of mechanics**	42
	Introduction to mechanics. Elements of kinematics. Dynamics of a material point and translational motion of a rigid body. Forces in mechanics. Dynamics of a rigid body that has a fixed axis of rotation. Conservation laws. Elements of special relativity	
PH9-1,	**2 Electrodynamics**	42

Шифри ДРН	**2**	**Обсяг складових,** *години*
РН9-2	General information about the electrostatic field. Electrostatic field in vacuum. Electrostatic field in matter. Direct electric current. A constant magnetic field in a vacuum. The effect of a magnetic field on moving charges and a current-carrying conductor. Magnetic field in matter. The phenomenon of electromagnetic induction. Fundamentals of Maxwell's theory for the electromagnetic field	
РН9-1, РН9-2, РН12-1	**3. Oscillatory and wave processes**	28
	General information about oscillating processes, free oscillations. Addition of harmonic oscillations, forced oscillations. Wave processes, elastic waves. Electromagnetic waves. The concept of alternating current. Periodic processes in alternating current circuits. General information about light waves. Interference of light. Diffraction of light. Polarization and dispersion of light. Elements of quantum mechanics	
РН9-1, РН9-2	**4. Molecular physics and thermodynamics**	16
	Elements of classical and quantum statistics. Fundamentals of thermodynamics. Elements of physical kinetics. Transfer processes. Aggregate states. Phase equilibrium and phase transformations	
РН9-1, РН9-2	**5. Elements of quantum theory of radiation, atomic physics and solid state physics**	20
	Fundamentals of quantum theory of thermal radiation. Some quantum optical effects. Physical foundations of quantum electronics. Spontaneous and forced radiation. Elements of atomic physics. Elements of band theory of solids and semiconductor physics. The concept of macroscopic quantum effects.	
РН9-6, РН9-4	**6. Physics of the atomic nucleus**	12
	Composition, binding energy of the nucleus and static characteristics of atomic nuclei. Nuclear reactions. Radioactivity. Elements of dosimetry and physical bases of nuclear energy. Fundamental particles and interactions; modern physical picture of the world.	
	Laboratory works	**80**
РН9-1, РН9-2, РН12-2	1. Laboratory work on the physical foundations of mechanics	24
	2. Laboratory work on electrodynamics	24
	3. Laboratory work on oscillatory and wave processes	12
	4. Laboratory works on molecular physics and thermodynamics	8
	5. Laboratory work on elements of quantum theory of radiation, atomic physics and solid state physics	10
	6. Laboratory work on atomic nucleus physics	2
	TOTAL	**240**

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	determining the average results of intermediate

practical	control tasks for each topic	tasks during practical classes	(CCW)	controls;
	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).

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 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

descriptors NLC	Requirements for knowledge, communication, autonomy and responsibility	Indicator evaluation
	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 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	- 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,	95-100

descriptors NLC	Requirements for knowledge, communication, autonomy and responsibility	Indicator evaluation
conditions; ♦ responsible for the professional development of individuals and/or groups ♦ the ability to continue study with a high degree of autonomy	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	
	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
	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, physical laboratory workshop (about 70 works), technical teaching aids (multimedia projector, computer laboratory works).

Distance learning platform Moodle.

8 RECOMMENDED BIBLIOGRAPHY

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