MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
DNIPRO UNIVERSITY OF TECHNOLOGY

Department of Construction, Geotechnics and Geomechanics

«APPROVED»
Head of Department
Hapieiev Serhii _____

«02» 07 2019

ACADEMIC DISCIPLINE WORK PROGRAM

«Construction Materials Science»

Field of study	19 Architecture and Construction
Specialty	192 Building and Civil Engineering
Academic degree	Bachelor
Educational and vocational training program	Building and Civil Engineering
Type of discipline	Basic
Total workload	7,5 credits ECTS (225 hours)
Type of final assessment	exam
Period of study	3-th semester
Language of study	English

Lecturers: Ass.Prof. Ivanova Hanna

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

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

Dnipro
DUT
2019

Academic discipline work program «Construction Material Science» for Bachelor's program 192 Building and Civil Engineering / H. Ivanova / Dnipro University of Technology, Department of CGG – D. : DUT, 2019. – 13 c.

Authors: – Ivanova Hanna

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 Building and Civil Engineering (record №7 by 01.07.2019).

CONTENTS

1 DISCIPLINE OBJECTIVES

In the educational and professional programs of the Dnipro University of Technology specialty 192 Building and Civil Engineering, the distribution of program learning outcomes (PLO) for the organizational forms of the educational process is done. In particular, the following learning outcomes are attributed to the discipline P3 «Construction Material Science»:

LO8	Demonstrate the ability to effectively use modern building materials, products and structures based on knowledge of their technical characteristics and manufacturing technology.

The objective of discipline - the formation of competencies for the effective use of modern building materials and products based on knowledge of their structure, basic properties, technical characteristics and manufacturing technology.

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

PLO code	**Disciplinary learning outcomes (DLO)**	
	PLO code	**content**
LO8	LO8-1	know the composition, structure and basic properties of building materials
	LO8-2	classify stone materials, know how they are obtained and processed
	LO8-3	classify ceramic materials, choose production methods and applications to regulate their properties in the right direction
	LO8-4	to classify steels and cast irons, to understand why metals alloy with other chemical elements, to know ways of protection against corrosion
	LO8-5	distinguish groups of binders by chemical composition, know their main properties and areas of application of materials and products based on binders
	LO8-6	know the types of artificial stone materials
	LO8-7	to design concrete composition, to know the technology of concrete mixture production, to determine the field of application of special types of concrete
	LO8-8	design the composition of mortars, depending on their field of application.
	LO8-9	know the composition and methods of glass production, its types and field of application
	LO8-10	know the features of wood products and means of protection against the negative effects of fire, insects and rot
	LO8-11	to be guided in different types of paints and finishing materials, to know features of their application
	LO8-12	choose materials to protect structures or structural elements from aggressive environmental influences

3 BASIC DISCIPLINES

Subjects	**The acquired learning outcomes**
B3 Physics; P17 Chemistry;	Use basic theories, methods and principles of natural sciences.

Subjects	The acquired learning outcomes
B1 Higher Mathematics; P2 Structural Mechanics; P13Study of Material Strength;	

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	75	26	49	-	-	-	-
practical	75	26	49	-	-	-	-
laboratory classes	75	26	49	-	-	-	-
TOTAL	225	78	147	-	-	-	-

5 DISCIPLINE PROGRAM BY TYPES OF CLASSES

PLO code	Types and topics of training sessions	Volume of components, hours
	LECTIONS	**75**
LO8-1	**1. Introduction. Composition, structure and basic properties of building materials.**	8
LO8-2	**2 Stone materials.**	2
LO8-3	**3 Ceramic materials and products.**	4
LO8-4	**4 Metals and metal rolling.**	3
LO8-5	**5 Binders. Hydraulic mineral binders. Organic binders and materials based on them.**	12
LO8-6	**6 Artificial stone materials.**	4
LO8-7	**7 Concrete. Technological features of concrete mixtures. Special types of concrete.**	16
LO8-8	**8 Building solutions.**	6
LO8-9	**9 Glass and glass products.**	4
LO8-10	**10 Forest materials and products.**	4
LO8-11	**11 Paints and varnishes and finishing materials**	6
LO8-12	**12 Heat, sound and waterproofing materials. Polymeric materials.**	6
	LABORATORY CLASSES	**75**
LO8-1	**1 Determination of structural characteristics of building materials.**	15
LO8-1 LO8-7	**2 Selection of composition and determination of the brand of concrete.**	20
LO8-5	**3 Determination of the main properties of gypsum binders**	10
LO8-1 LO8-10	**4 Determination of water absorption and softening coefficient of some building materials.**	10

PLO code	Types and topics of training sessions	Volume of components, hours
LO8-5	**6 Determination of the main characteristics of construction lime.**	10
LO8-1 LO8-5	**7 Determination of the brand by compressive strength (bending) of mineral binders.**	10
	PRACTICAL	**75**
LO8-1 LO8-2 LO8-3 LO8-4 LO8-6 LO8-9 LO8-10	**1 General properties of building materials.**	35
LO8-5	**2 Inorganic binders.**	10
LO8-1 LO8-2 LO8-7	**3 Fillers for concrete.**	10
LO8-8	**4 Building solutions.**	10
LO86-12	**5 Bitumens and materials based on them**	10
LO8-11 LO8-12	**6 Paint and varnish, finishing and insulating materials**	10
	TOTAL	**225**

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>training sessions</th><th>diagnostic tools</th><th>training sessions</th></tr>
<tr><td>lecture</td><td>control surveys</td><td>performing the task during lectures</td><td rowspan="4">comprehensive reference work (CRW)</td><td rowspan="4">determination of the weighted average result of current controls and protection of laboratory works;

performing KKR during the exam at the request of the student</td></tr>
<tr><td rowspan="2">practical</td><td>control tasks</td><td>performing tasks during practical classes</td></tr>
<tr><td>individual task</td><td>performing tasks during independent work</td></tr>
<tr><td>laboratory</td><td>work protection</td><td>execution during the consultation</td></tr>
</table>

During the current control, lectures are evaluated by determining the quality of control specific tasks. Practical classes are evaluated by the quality of control and individual tasks, laboratory classes are evaluated during their defense.

If the content of a 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 CRW, which contains tasks covering key disciplinary learning outcomes.

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

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

The integral value of the CRW performance assessment can be determined by considering the weighting factors established by the department for each NQF 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 practical 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 NQF for the Bachelor's level of higher education (given below).

Integral competence is the ability to solve complex problems and specialized practical problems in 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.

NQF descriptors	Requirements for knowledge, communication, autonomy and responsibility	Indicator evaluation
Knowledge		
♦ Conceptual knowledge acquired during the training and professional activities, including some knowledge of modern	- 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

NQF descriptors	Requirements for knowledge, communication, autonomy and responsibility	Indicator evaluation
achievements; ♦ critical understanding of the main theories, principles, methods, and concepts in education and careers	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
	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	95-100

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

NQF descriptors	Requirements for knowledge, communication, autonomy and responsibility	Indicator evaluation
	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

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7 TOOLS, EQUIPMENT, AND SOFTWARE

Technical training. Laboratory equipment and inventory.

8 RECOMMENDED BIBLIOGRAPHY

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«Будівельне матеріалознавство»
для бакалаврів спеціальності 192 «Будівництво та цивільна інженерія»

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