Syllabus educational component of the elective discipline

Name of the discipline:	Maintenance of engineering structures
Level of higher education:	first (bachelor)
Course page in Moodle:	https://dl2022.khadi.kharkov.ua/course/view.php?id=2326
The volume of the educational	3 credits (90 hours)
component	
Form of final control	Offset
Consultations:	on schedule
	Department of bridges, structures and construction
Name of the department:	mechanics named after V.O. Rosiyskiy
Language of instruction:	Ukrainian, English
Course leader:	Synkovska Olena, PhD, Associate Professor
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Maintenance of engineering structures

Summary of educational component:

The goal is the formation of students' basic knowledge and skills, general and professional competences in the maintenance and service of transport (bridge and tunnel) structures, in accordance with the requirements of modern regulatory documents and the needs of the industry for further professional activity.

Subject: system of concepts about the maintenance, repair and maintenance of buildings and territories and planning of the technical maintenance system

The main tasks of studying an academic discipline are:

- study of the system and equipment of ventilation of transport tunnels;
- mastering the basic means of lighting transport tunnels;
- mastering the methods of diagnosing physical processes and the state of structures, instrumental measurements and visual determinations;
- determination of the cost of maintenance works of engineering structures;
- definition of optimization methods and methodology of search and selection of technological maintenance solutions;
- solving engineering problems related to maintenance and repairs;
- study of the impact of corrosion on the condition of metal elements of transport facilities;
- development of methods and materials for protecting metal elements of transport structures from the effects of corrosion.

A cycle of lectures in combination with practical and independent work of the applicants is provided for the formation of the knowledge system.

Prerequisites for studying the educational component:

Mathematics; Informatics; Chemistry; Construction materials science; Building structures and architecture; Transport tunnels, Organization of construction, Economics of construction.

Competencies acquired by the applicant:

General competencies:

- Ability to abstract thinking, analysis and synthesis.
- Knowledge and understanding of the subject area and professional activity.

- Ability to use information and communication technologies.
- Ability to search, process and analyze information from various sources

Professional competences:

- Ability to organize work in accordance with the requirements of life safety and occupational health and safety. The ability to assess risks, their possible consequences at the stages of the life cycle of bridge and tunnel structures, to analyze defects that arise during the operation of engineering structures. The ability to make decisions to prevent the negative consequences of such risks.
- Ability to argue the choice of methods for solving specialized problems, analytically evaluate the obtained results.
- Ability to perform technical control, supervision during construction, repair and reconstruction of bridges and tunnels.

Learning outcomes according to the educational program:

- Design and implement technological processes of construction production, using appropriate equipment, materials, tools and methods.
- Apply modern information technologies to solve engineering and management problems of construction and civil engineering.

		Number of	
no. of topics		hours	
	Name of topics (LC, PR, SR)	Full -	Part -
		time	time
		learning	learning
	LC Maintenance, repair and maintenance of buildings and territories	4	4
1	PR Operational reliability of tunnels	4	4
	SR Stages of tunnel operation	8	8
	LC Tunnel ventilation and lighting	4	4
2	PR Study of the ventilation system and equipment	2	2
2	SR The concentration of gases and compounds in the tunnel are the main factors	10	10
	LC Determination of the state of constructions of engineering structures	4	4
3	PR Measures for long-term safe operation of motor vehicle and pedestrian tunnels	2	2
	SR Measures to prevent and quickly eliminate possible violations or accidents during the operation of motor vehicle and pedestrian tunnels	8	8
	LC Economic issues of building maintenance	4	4
4	PR Lighting installation schemes: advantages and disadvantages	2	2
	SR Sunscreens	10	10
	LC Planning the system of technical maintenance and repair of engineering structures	4	4
5	PR Base of normative documents on technical maintenance and repair of engineering structures	2	2
	SR Acquaintance with the materials of regulatory documents regarding the system of technical maintenance and repair of engineering structures	8	8
6	LC Search and selection of solutions for maintenance and repair of bridge structures	4	4

Thematic plan

	PR Requirements for the maintenance of bridge structures	2	2		
	CP Requirements for the maintenance of the span structure of				
	bridge structures	0	U		
	LC Features of diagnostics of bridges with metal and steel-reinforced	4	Δ		
	concrete span structures	т	Т		
7	PR Current inspections of bridge structures	2	2		
	SR Features of diagnostics of bridges with metal and steel-	10	10		
	reinforced concrete span structures in the winter period	10	10		
8	LC The effect of corrosion on the condition of metal elements of	1	1		
	transport structures, methods and materials for protection	4	4		
	PR Protection of metal structures from corrosion	2	2		
	SR Mastering the examination and testing of metal bridge				
	structures using corten steel on the example of European	10	10		
	countries				
Total	LC	32	32		
	PR	16	16		
	SR	42	42		

Individual educational and research task (if available):

Teaching methods:

1) verbal: 1.1 traditional: lectures, explanations, stories, etc.;

1.2 interactive (non-traditional): problem lectures, discussions, etc.;

2) visual: method of illustrations, method of demonstrations

3) practical: 3.1 traditional: practical classes, seminars;

3.2 interactive (non-traditional seminars-discussions, "round table".

Evaluation system and requirements:

Current academic performance

1 The current performance of applicants for the performance of educational activities in the classroom and for the performance of independent work is assessed using a four-point grading scale with the subsequent conversion to a 100-point scale. When assessing current progress, all types of work provided by the curriculum are taken into account.

1.1 Lecture classes are evaluated by determining the quality of specific tasks.

1.2 Practical classes are assessed by the quality of the control or individual task, performance and design of practical work.

1.3 Laboratory classes are evaluated by the quality of laboratory reports.

1.4 Seminar classes are evaluated by the quality of individual assignments / essays.

2 Evaluation of the current progress of higher education students is carried out at each practical lesson (laboratory or seminar) on a four-point scale ("5", "4", "C", "2") and recorded in the academic record book.

- "excellent": the applicant has flawlessly mastered the theoretical material, demonstrates deep knowledge of the relevant topic or discipline, the main provisions;

- "good": the applicant has mastered the theoretical material well, knows the main aspects of the primary sources and recommended literature, reasonably presents it; has practical skills, expresses his thoughts on certain problems, but makes certain inaccuracies and errors in the logic of the presentation of theoretical content or in the analysis of practical content;

- "satisfactory": the applicant has basically mastered the theoretical knowledge of the subject or discipline, is oriented in the primary sources and recommended literature, but unconvincingly answers, confuses concepts, hesitates to answer additional questions, does not have stable knowledge; answering questions of a practical nature, shows inaccuracy in knowledge, is unable to evaluate facts and phenomena, to relate them to the future profession;

- "unsatisfactory": the applicant has not mastered the educational material of the topic (discipline), does not know scientific facts, definitions, is almost not oriented in primary sources and recommended literature, there is no scientific thinking, practical skills are not formed.

3 The final score for the current activity is recognized as the arithmetic mean of points for each class, for individual work, current control works according to the formula:

$$\mathbf{K}^{curr} = \frac{\mathbf{K}\mathbf{1} + \mathbf{K}\mathbf{2} + \dots + \mathbf{K}n}{n}$$

where K^{curr} is the final assessment of success based on the results of the current control;

- *K1,K2,...,Kn* assessment of the success of the *n* current control measure;
- *n* number of current control measures.

Scores are converted into points according to the conversion scale (Table 1).

4-point scale	100-point scale	4-point scale	100-point scale	4-point scale	100- point scale	4-point scale	100-point scale
5	100	4,45	89	3,90	78	3,35	67
4,95	99	4,4	88	3,85	77	3,3	66
4,9	98	4,35	87	3,80	76	3,25	65
4,85	97	4,3	86	3,75	75	3,2	64
4,8	96	4,25	85	3,7	74	3,15	63
4,75	95	4,20	84	3,65	73	3,1	62
4,7	94	4,15	83	3,60	72	3,05	61
4,65	93	4,10	82	3,55	71	3	60
4,6	92	4,05	81	3,5	70	from 1.78 to 2.99	from 35 to 59
						reassen	nbly
4,55	91	4,00	80	3,45	69	from 0 to 1.77	from 0 to 34
4,5	90	3,95	79	3,4	68	re-examir	ation

Table 1 - Conversion of the average score for the current activity into a multi-point scale

Final evaluation

1 A higher education student receives a credit at the last class of the discipline based on the results of the current assessment. The average grade for the current activity is converted into points on a 100-point scale, according to the conversion table (Table 1). Higher education applicants who have a current average grade in the discipline below "3" (60 points) in the last class can increase their current score by taking tests in the discipline.

Assessment of knowledge of applicants by testing is carried out on a scale:

- "Excellent": at least 90% of correct answers;
- "Very good": from 82% to 89% of correct answers;
- "Good": from 74% to 81 % of correct answers;
- "Satisfactory": from 67% to 73% of correct answers;
- "Satisfactory enough": from 60% to 66% of correct answers;
- "Unsatisfactory": less than 60% of correct answers.
- 2 The condition for receiving credit is:
- working off all missed classes;
- the average current grade in the discipline is not lower than "3" (60 points).

3 Additional points are awarded for individual independent work and participation in scientific events.

3.1 Additional points are added to the sum of points gained by the applicant for higher education for the current educational activity (for disciplines, the final form of control for which is a test), or to the final grade in the discipline, the final form of control for which is an exam.

3.2 The number of additional points awarded for different types of individual tasks depends on their volume and significance:

- prizes in the discipline at the international / all-Ukrainian competition of scientific student works - 20 points;

- prize places in the discipline at the national competitions - 20 points;

- participation in the international / all-Ukrainian competition of scientific student works - 15 points

- participation in international/national scientific conferences of students and young scientists - 12 points;

- participation in national competitions in the discipline - 10 points

- participation in Olympiads and scientific conferences of KhNADU in the discipline - 5 points;

- performance of individual research (educational and research) tasks of increased complexity - 5 points.

3.3 The number of additional points cannot exceed 20 points.

4 The learning outcome is evaluated (select the required):

- on a two-point scale (passed/not passed) according to Table 2;

- on a 100-point scale (knowledge assessment scale) according to Table 3.

The final score together with additional points cannot exceed 100 points.

Table 2 - Scale of	points conversion to the n	ational evaluation system
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On a 100-point scale	On a national scale
from 60 points to 100 points	enrolled
less than 60 points	unaccounted for

Table 3 - Scale for assessing the knowledge of students based on the results of the final control of the discipline

Score	Assessment on the national scale		Evaluation according to the ECTS scale		
in points			Evaluation	Criteria	
	exam	credit			
90- 100	That's great.	Enrolled	A	The theoretical content of the course is mastered completely, without gaps, the necessary practical skills of working with the mastered material are formed, all the training tasks provided by the training program are completed, the quality of their implementation is estimated by the number of points close to the maximum	
80–89	Okay	Enrolled	В	The theoretical content of the course is mastered completely, without gaps, the necessary practical skills of working with the mastered material are basically formed, all the training tasks provided by the training program are completed, the quality of most of them is estimated by the number of points close to the maximum	

Score	Assessment on		Assessment on Evaluation according to the ECTS scale	
in nointe	the national scale		Evaluation	Criteria
points	exam	credit		
75-79			C	The theoretical content of the course is fully mastered, without gaps, some practical skills of working with the mastered material are insufficiently formed, all the training tasks provided by the curriculum are completed, the quality of any of them is not assessed by the minimum number of points, some types of tasks are performed with errors
67-74	factory		D	The theoretical content of the course is partially mastered, but the gaps are not significant, the necessary practical skills of working with the mastered material are basically formed, most of the training tasks provided by the curriculum are completed, some of the completed tasks may contain errors
60–66	Satist 99–09		E	The theoretical content of the course is partially mastered, some practical skills have not been formed, many of the training tasks provided by the curriculum have not been completed, or the quality of some of them is estimated by the number of points close to the minimum.
35–59	Unsatisfactory	enrolled	FX	The theoretical content of the course is partially mastered, the necessary practical skills have not been formed, most of the learning tasks provided by the curriculum have not been completed, or the quality of their implementation is estimated by the number of points close to the minimum; with additional independent work on the course material, it is possible to improve the quality of learning tasks (with the possibility of repeating)
0–34	Unsatisfactory	Not e	F	The theoretical content of the course has not been mastered, the necessary practical skills have not been formed, all completed training tasks contain gross errors, additional independent work on the course material will not lead to any significant improvement in the quality of training tasks (with a mandatory repeated course)

Policy of the course:

- the course involves teamwork, the environment in the classroom is friendly, creative, open to constructive criticism;

- mastering the discipline involves mandatory attendance of lectures and practical classes, as well as independent work;

- independent work involves the study of individual topics of the discipline, which are submitted in accordance with the program for independent study, or were considered briefly;

- all tasks provided by the program must be completed in due time;

- if the applicant for higher education is absent from classes for a valid reason, he/she presents the completed tasks during independent preparation and consultation of the teacher;

- the term paper must be defended no later than one week before the start of the

examination session (indicated if available);

- while studying the course, higher education students must adhere to the rules of academic integrity set out in the following documents: "Rules of academic integrity of participants of the educational process of KNADU" (https://www.khadi.kharkov.ua/fileadmin/P Standart/pologeniya/stvnz 67 01 dobroch 1.p df), "Academic integrity. Checking the text of academic, scientific and qualification papers for plagiarism"

(https://www.khadi.kharkov.ua/fileadmin/P Standart/pologeniya/stvnz 85 1 01.pdf), "Moral and ethical code of participants in the educational process of KNADU (https://www.khadi.kharkov.ua/fileadmin/P Standart/pologeniya/stvnz 67 01 MEK 1.pdf).

- in case of detection of the fact of plagiarism, the applicant receives 0 points for the task and must repeat the tasks provided in the silabus;

cheating during tests and exams is prohibited (including using mobile devices). Mobile devices are allowed to be used only during online testing.

Recommended literature: (literature no later than 10 years old, except for 1 fundamental classical textbook or monograph)

1. Ekspluatatsiya i rekonstruktsiya mostiv / N.YE. Strakhova ta in./ - K.: Transportna akademiya Ukrayiny, 2000. – 384s.

2. Luchko Y.Y. Metody doslidzhennya ta vyprobuvannya budivel'nykh materialiv i konstruktsiy. /Y.Y. Luchko, P.M. Koval', M.L. Dem"yan. – L'viv: Kamenyar, 2001. – 433s.

3. Byl'chenko A.V. Problemy dolhovechnosty zhelezobetonnykh konstruktsyy. / A.V. Byl'chenko, A.H. Kyslov, E.V. Syn'kovskaya // Naukovyy visnyk budivnytstva – KH: KHNUBA, 2018. – T92, №2. – s.162-165.

4. Bil'chenko A.V. Dovhovichnist' zalizobetonnykh konstruktsiy ye osnovoyu zhyttyevoho tsyklu mostovykh sporud. / A.V. Bil'chenko, O.H. Kislov, O.V. Syn'kovs'ka, A.V. Ihnatenko // Naukovyy visnyk budivnytstva – KH: KHNUBA, 2018. – T 94, №4. – s.140-144.

5. Kozhushko V.P. Problemy nauchno-tekhnycheskoho soprovozhdenyya kapytal'noho remonta mostovykh sooruzhenyy / V.P. Kozhushko. A.V. Byl'chenko, A.H. Kyslov, A.S. Lozytskyy, E.V. Syn'kovskaya // Vesnyk KHNADU – KH: KHNADU, 2018. – Vyp.81. –s.74-81.

6. Byl'chenko A.V. Voprosy ékspluatatsyy mostovykh sooruzhenyy na avtomobyl'nykh dorohakh rehyonal'noho urovnya / A.V. Byl'chenko, A.H. Kyslov, E.V.Syn'kovskaya, M.A. Mytrokhyna // Naukovyy visnyk budivnytstva – KH: KHNUBA, 2018. – T91, №1. – s.244-248.

Additional sources:

1. distance course: https://dl2022.khadi.kharkov.ua/course/view.php?id=2326

2. State construction standards of Ukraine: DBN, DSTU, SNiP, GOST, SN, VBN. <u>http://dbn.at.ua/</u>

3. Dovidnyk mostovoho maystra z utrymannya ta remontu mostiv. Ukravtodor. K. – 2007. – 135 s.

4. Instruktsiya po orhanizatsiyi dohlyadu za shtuchnymy sporudamy. IN.V.3.2.-218-003449261.036-96 UD VTP "Ukrdortekhnolohiya". – Kyyiv, 1996. – 90s.

Developer(s)

the syllabus of the academic discipline

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