Syllabus educational component (by the choice of higher education students)

RESOURCE SAVING AND NEW MATERIALS

Subjects:	Resource saving and new materials
Level of higher education:	first (bachelor's degree)
Course page in Moodle:	https://dl2022.khadi-kh.com/course/view.php?id=1434
The scope of the educational	3 credits (90 hours)
component	
Final control form	Test
Consultations:	on schedule
Name of the department:	Department of Road Construction Materials
	Technology
Teaching language:	Ukrainian
Course leader:	Serhii Oksak, Ph.D., associate professor
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Brief content of the educational component:

The purpose of the educational component is: detailed study of ways to reduce the resource intensity of road construction, mastery of methods and ways to reduce energy consumption in the technology of cement concrete and reinforced concrete and asphalt concrete, study of the features of the use of industrial waste for the production of construction materials, mastery of methods of saving cement and bitumen in road construction, mastery of the basics of improvement technologies of mixing asphalt concrete and cement concrete mixtures, obtaining ideas about modern scientific and industrial progress in the field of technology of road construction materials.

Subject: theoretical, physico-chemical and scientific base of the production and use of materials, their quality management, quality control methods at all stages of their life cycle. **The main tasks of studying the academic discipline are:**

- formation of a set of knowledge, skills and ideas regarding the possibilities and regularities of using industrial waste and by-products of industry for the production of construction materials and products in order to reduce the resource consumption of road construction.

- formation of a scientific worldview, professional capacity and general outlook regarding the base of production and increasing the durability of materials in road construction;

- formation of directions for improvement and development of ways to reduce energy consumption in technologies used in road construction.

Prerequisites for studying the educational component: the study of this educational component is preceded by the following disciplines: «Engineering geology», «Construction materials science», «Physico-chemical mechanics of road construction materials».

Competencies acquired by the acquirer:

General competences:

GC02. Knowledge and understanding of the subject area and professional activity. **Special (professional) competences:**

SC03. The ability to design construction structures, buildings, structures and engineering networks (according to specialization), taking into account engineering and technical and

resource-saving techniques, legal, social, ecological, technical and economic indicators, scientific and ethical aspects, and modern requirements of regulatory documentation in the field of architecture and construction, environmental protection and labor safety.

Learning outcomes according to the educational program: Program learning outcomes

LO04. Design and implement technological processes of construction production, using appropriate equipment, materials, tools and methods.

LO08. Rational use of modern construction materials, products and structures based on knowledge of their technical characteristics and manufacturing technology.

LO09. Design construction structures, buildings, structures, engineering networks and technological processes of construction production, taking into account engineering and resource-saving methods, legal, social, ecological, technical and economic indicators, scientific and ethical aspects, and modern requirements of regulatory documentation, time and other restrictions, in the field of architecture and construction, environmental protection and labor safety.

No. topics		Number of	
	Name of topics (LC W/ PW/ SC IW)	hours	
		Full-	exter-
		time	nal
1	2	3	4
	LC. Reducing the resource intensity of road construction. In other		
	words, waste, its processing and use.	2	2
1	PW. Determination of the influence of methods of intensification of the		
•	technology of concrete and mortar mixes.	2	
	IW. The main directions of resource conservation in the technology of		
	road construction materials	7	9
	LC. Stone road construction materials from industrial wastei.	2	
	PW. The choice of direction of use of industrial waste		
2	IW. Study of the requirements for assessing the suitability of raw mate-	2	
	rials for the production of building materials. Classification of industrial		
	waste and by-products.	7	11
	LC. Ways to reduce energy consumption in the technology of cement	2	2
	concrete and reinforced concrete.		
3	PW. Determination of the influence of the amount of microfiller additive	2	2
5	on the normal density of cement dough		
	IW. Studying the ways of using incidentally mined rocks for the ar-	7	7
	rangement of layers of road pavement.		
	LC. Ways of saving cement in road construction. Mineral binders using	2	
	metallurgical slags.		
4	PW. Determination of the effect of the amount of microfiller additive on		
-	the consistency of the soluble mixture	2	
	IW. Reduction of cement costs due to the adding of superplasticizing		
	additives in the composition of cement-concrete mixtures.	8	12
	LC. Ways to reduce energy consumption in asphalt concrete technol-		
	ogy. Ways of saving bitumen in road construction.	2	2
5	PW. The selection of constituent materials for the production of asphalt		
5	concrete mixtures taking into account the minimum energy consump-	2	
	tion		
	IW. Improvement of the technology of mixing asphalt concrete mixtures	7	9

Thematic plan

1	2	3	4
6	LC. Road organic binders from oil industry waste. PW_The selection of types of asphalt concrete mixtures taking into ac-	2	
	count the minimum energy consumption for their laying and compac- tion	2 7	11
	IW. Ways to improve the quality of mineral powders for asphalt con- cretey		
	LC. Intensification of oxidized bitumen production processes. PW. Determination of indicators of aggregation of mineral powders	2	2
7	from raw materials of different porosity	2	
	IW. The use of by-products of the oil industry to expand the resources of oil binders.	8	10
8	LC. Improvement of the technology of mixing asphalt concrete mix-	2	
	PW. Determination of bituminous capacity indicators of mineral pow-	2	
	ders from raw materials of different porosity	7	11
	IW. Regeneration of old asphalt concrete		
To-	LC	16	6
no- aether	PW.	16	4
yenner	IW.	58	80

Teaching methods:

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

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

2) visual: the method of illustrations, the method of demonstrations

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

Evaluation system and requirements:

Current performance

1 The current success of applicants for the performance of educational types of work in training sessions and for the performance of independent work tasks is evaluated using a four-point rating scale with subsequent transfer to a 100-point scale. During the evaluation of the current academic performance, all types of work provided by the educational program are taken into account.

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

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

2 The current performance of higher education applicants is assessed at each practical session (laboratory or seminar) on a four-point scale («5», «4», «3», «2») and entered in the journal of academic performance.

- «excellent»: the applicant mastered the theoretical material flawlessly, demonstrates indepth knowledge of the relevant topic or academic discipline, the main provisions;

– «good»: the applicant has mastered the theoretical material well, possesses the main aspects from primary sources and recommended literature, presents it in a reasoned manner; has practical skills, expresses his thoughts on certain problems, but certain inaccuracies and errors are assumed in the logic of the presentation of theoretical content or in the analysis of practical;

- «satisfactory»: the applicant has basically mastered the theoretical knowledge of the educational topic or discipline, orients himself in primary sources and recommended

literature, but answers unconvincingly, confuses concepts, answers additional questions uncertainly, does not have stable knowledge; when answering questions of a practical nature, reveals inaccuracy in knowledge, does not know how to evaluate facts and phenomena, connect them with the future profession;

– «unsatisfactory»: the applicant has not mastered the educational material of the topic (discipline), does not know scientific facts, definitions, hardly orients himself in primary sources and recommended literature, lacks scientific thinking, practical skills are not formed.
 3 The final score for the current activity is recognized as the arithmetic mean sum of points for each lesson, for individual work, current control works according to the formula:

$$K^{current} = \frac{K_{1} + K_{2} + \dots + K_{n}}{n},$$

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

K1, K2, ..., Kn – assessment of the success of the n-th measure of current control;

n – number of ongoing control measures.

Grades are converted into points according to the calculation scale (table 1).

00010							
4-point	100- point	4- point	100- point	4- point	100- point	4- point	100- point
scale	scale	scale	scale	scale	scale	scale	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
						reasser	mbly
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	repeated	study

 Table 1 – Recalculation of the average grade for the current activity into a multi-point scale

Final assessment

1 A student of higher education receives a credit in the last lesson in the discipline based on the results of the current assessment. The average score for the current activity is converted into points on a 100-point scale, according to the conversion table (table 1).

Applicants of higher education who have an average current score in the discipline lower than "3" (60 points) can increase their current score in the last session by taking tests in the discipline.

Assessment of knowledge of applicants by means of testing is carried out according to 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 obtaining credit is:

- making up for all missed classes;

- average current grade in the discipline not lower than «3» (60 points).

3 For performing individual independent work and participating in scientific events, winners are awarded additional points.

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

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

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

- prize places in the discipline at the All-Ukrainian Olympiads - 20 points;

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

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

- participation in all-Ukrainian Olympiads in the discipline - 10 points

- participation in Olympiads and scientific conferences of the KhNAHU 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 result is evaluated on a 100-point scale (for differentiated assessment) according to table 2.

 Table 2 – The scale for evaluating the knowledge of students based on the results of the final control of the academic discipline

Score in	National scale		Mark in ECTS scale				
points	exam test		Mark	Criteria			
90-100	Perfectly	Enrolled	A	The theoretical content of the course has been mas- tered in its entirety, without gaps, the necessary practi- cal skills for working with the mastered material have been formed, all educational tasks provided for in the training program have been completed, the quality of their performance has been assessed with a number of points close to the maximum			
80–89	Ø	led	В	The theoretical content of the course has been mas- tered in its entirety, without gaps, the necessary practi- cal skills for working with the mastered material have mainly been formed, all educational tasks provided for by the training program have been completed, the qual- ity of most of them has been assessed with a number of points close to the maximum			
75-79	Enrol	Enrol	C	The theoretical content of the course has been mas- tered in its entirety, without gaps, some practical skills of working with the mastered material have not been formed enough, all educational tasks provided for by the training program have been completed, the quality of none of them has been assessed with a minimum num- ber of points, some types of tasks have been completed with errors			

Score in	National scale		Mark in ECTS scale			
points	exam test		Mark	Criteria		
67-74	ctorily		D	The theoretical content of the course is partially mas- tered, but the gaps are not of a significant nature, the necessary practical skills for working with the mastered material are basically formed, most of the educational tasks provided by the training program have been com- pleted, some of the completed tasks may contain errors		
60–66	Satisfa		E	The theoretical content of the course has been partially mastered, some practical work skills have not been formed, many educational tasks provided by the training program have not been completed, or the quality of some of them has been evaluated with a number of points close to the minimum.		
35–59	Unsatisfactorily	counted	FX	The theoretical content of the course has been partially mastered, the necessary practical work skills have not been formed, most of the prescribed training programs of educational tasks have not been completed, or the quality of their implementation has been assessed with a number of points close to the minimum; with additional independent work on the course material, it is possible to improve the quality of the performance of educational tasks (with the possibility of retaking)		
0–34	Unacceptable	Not	F	The theoretical content of the course has not been mas- tered, the necessary practical work skills have not been formed, all completed educational tasks contain gross errors, additional independent work on the course ma- terial will not lead to any significant improvement in the quality of the performance of educational tasks (with a mandatory repeat course).		

Course policy:

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

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

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

- all tasks provided by the program must be completed within the set time;

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

- while studying the course, students of higher education must adhere to the rules of academic integrity set forth in the following documents: «Rules of academic integrity of participants in the educational process of the KhNAHU» (https://www.khadi.kharkov.ua/fileadmin/P Standart/pologeniya/stvnz 67 01 dobroch 1.pdf), «Academic integrity. Checking of academic. scientific qualification the text and works 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 the KhNAHU»

«Moral and ethical code of participants in the educational process of the KhNAHU» (<u>https://www.khadi.kharkov.ua/fileadmin/P_Standart/pologeniya/stvnz_67_01_MEK_1.pdf</u>).

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

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

Recommended Books

1. Золотарев В.А. Дорожные битумные вяжущие и асфальтобетоны. Часть 1. Дорожные битумные вяжущие: учебник / В.А. Золотарев. – Х.: ХНАДУ, 2014. – 180 с.

2. Золотарев В.А. Дорожные битумные вяжущие и асфальтобетоны. Часть 2. Дорожные асфальтобетоны: учебник / В.А. Золотарев. – Харьков: ХНАДУ, 2016. – 204 с.

3. Космін О.В., Кудрявцева Вальдес С.В. Ресурсозбереження та нові технології. Розділ: Шляхи економії органічних в'яжучих у дорожньому будівництві. Конспект лекцій. -ХНАДУ. Харків, 2015. – 82 с.

4. Саницький М.А. Енергозберігаючі технології в будівництві: навч. посібник. – Львів: Видавництво Львівської політехніки, 2013. – 236 с.

5. Канюк Г.І., Пугачова Т.М., Без'язичний В.Ф., Близниченко О.М., Шматков Д.І. Основи енерго- і ресурсозбереження: навчальній посібник. – Харків: друкарня "Мадрид", 2016. – 230 c.

6. Дзядикевич Ю.В. Економічні основи ресурсозбереження. Навчальний посібник. – Тернопіль: Вектор, 2015. – 76 с.

7. Космін О.В. Ресурсозбереження та нові матеріали. Розділ: Кам'яні матеріали з відходів промисловості. Шляхи економії мінеральних в'яжучих у дорожньому будівництві. Конспект лекцій. – ХНАДУ, Харків, 2012. - 112 с.

8. Космін О.В. Методичні вказівки до розрахунків з енергозбереження при виробництві дорожньо-будівельних матеріалів / Космін О.В. - Х.: ХНАДУ, 2012. – 40 с.

9. ДСТУ 9171:2021 Настанова щодо забезпечення збалансованого використання природних ресурсів під час проектування споруд [Чинний від 2022-08-01]. К.: ДП «Укр-НДНЦ», 2022. - 88 с.

Additional resources:

- 1. distance course: https://dl2022.khadi-kh.com/course/view.php?id=1434
- 2. http://www.nbwv.gov.ua
- 3. http://korolenko.kharkov.com
- 4. http://library.univer.kharkov.ua

Developer(s) the syllabus of the academic discipline

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