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

BUILDING MATERIAL SCIENCE

Discipline name:	**Building Material Science (special course)**
Level of higher education:	**first (bachelor's degree)**
Course page in Moodle:	*https://dl2022.khadi-kh.com/course/view.php?id=3639*
The scope of the educational component	**3 credits (90 hours)**
Final control form	**Test**
Consultations:	**on schedule**
Name of the department:	**Department of Road Construction Materials Technology**
Teaching language:	**Ukrainian**
Course leader:	**Galkin Andrii, PhD., assistant**
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Brief content of the educational component:
The purpose of the educational component is: thorough study of road construction materials based on organic and inorganic binders, primarily road asphalt concrete for various purposes, as well as cement concrete, their composition, structure, properties, producing technology, characteristics of behavior in road pavement; mastering methods of laboratory prediction of their ability to resist the influence of destructive operational and environmental factors, as well as methods of directed regulation of their behavior; mastering the physic-chemical and rheological bases of the construction of these materials and their input in road pavement and methods of laboratory analysis of components, knowledge of novel scientific and industrial progress in the field of road construction materials technology.
Subject: theoretical, physic-chemical, rheological foundations of design and application, scientific and technical foundations of construction of materials, their quality regulation, methods of quality control at all stages of their life cycle.

The main tasks of studying an academic discipline are:

- study of the physical, chemical and mechanical foundations of the design and performance of materials in road constructions;
- awareness of the current state in the field of road materials science and prediction of ways to achieve progress in ensuring their durability;
- gaining of skills in performing technical and physical-mechanical tests in order to ensure the quality of the technological processes of their manufacture and durability in the processes of their service in operating conditions.

Prerequisites for studying the educational component: the study of this educational component is preceded by the following disciplines: "Chemistry", "Physics", "Engineering Geology", "Construction Materials Science".

Competencies acquired by the acquirer:
Integral competence: Ability to solve complex specialized tasks of construction and civil engineering.

Special (professional) competences

Ability to choose and use appropriate equipment, materials, tools and methods for designing and implementing technological processes of construction production.

To have technology, methods of improving technological processes of construction, operation, maintenance, repair and reconstruction of highways and airfields, production and use of road construction materials, products and structures.

Program learning outcomes

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

Rationally use novel building materials, products and structures based on knowledge of their technical characteristics and producing technology.

Thematic plan

№	Name of topics (LC, LW, PW, SC, IW)	Number of hours	
		Full-time	external
1	LC Air mineral binders. Air lime. Gypsum binding materials LW Air binders IWS Novel methods of building materials testing	2 4 3	
2	LC Metallurgical slag as raw material for the production of building materials IWS Types of slags	2 4	
3	LC Building mortars LW Construction mortars, cement mortars and cement-concrete mixtures IWS Classification of construction mortars	2 4 3	
4	LC Ceramic materials and products SRS Quality control of ceramic materials	2 4	
5	LC Fluxed road bitumens and road bitumen emulsions LW Fluxed bitumen and bitumen emulsions IWS Fluxed bitumens modified with a polymer and emulsions of polymer-modified bitumens	2 4 3	
6	LC Modified bitumens IWS Bitumens modified with complex additives	2 4	
7	LC Novel varieties of asphalt concrete LW Bituminous polymer binders and asphalt polymer concrete IWS Methods of determining technological temperatures, technologies for reducing the temperatures of mixtures producing	2 2 3	
8	LC The structure of asphalt concrete and the formation of their mechanical properties LW Cold asphalt concrete mixes and asphalt concrete pavements quality control IWS Ecological aspects of asphalt concrete technologies	2 2 4	
Together	LC	16	
	LW	16	
	IWS	58	

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): business and role-playing games, trainings, seminars-discussions, "round table", brainstorming method.

Evaluation system and requirements:

Current success
1 The current success rate of applicants for the performance of educational types of work in training classes 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 specific tasks.
1.2 Laboratory classes are evaluated by the quality of reports on the performance of laboratory work.
2 Assessment of the current performance of higher education applicants is carried out at each practical session (laboratory or seminar) on a national four-point scale ("5", "4", "3", "2") and entered in the journal of academic performance.

- "excellent": the applicant mastered the theoretical material flawlessly, demonstrates in-depth knowledge of the relevant topic or academic discipline, the main aspects;
- "good": the applicant has mastered the theoretical material well, gained the main aspects from primary sources and recommended literature, presents it in an argumentative 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 ones;
- "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 calculating as the arithmetic mean sum of points for each lesson, for individual work, current control works according to the formula:

$$K^{current} = \frac{K1+K2+\ldots+Kn}{n},$$

where $K^{current}$ – the final assessment of success based on the results of current control;
$K1, K2, \ldots, Kn$ – assessment of success of n measure of current control;
n – number of ongoing control measures.
Assessments are converted into points according to the calculation scale (table 1).

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

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
						new testing	
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	new testing	

Final assessment

1 The 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 for higher education who have a current grade point average in the discipline lower than "3" (60 points) can increase their current grade by taking tests in the discipline in the last session.

Assessment of the knowledge of applicants through testing is carried out according to the following 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;
– the average current grade in the discipline is not lower than "3" (60 points).

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

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 credit), 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 various 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 All-Ukrainian Olympiads - 20 points;
- participation in the international / all-Ukrainian competition of scientific student projects - 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 scientific and 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 (*select is required*):

– on a two-point scale (passed/failed) according to table 2;

– on a 100-point scale (for differentiated assessment) according to table 3.

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

Table 2 – Scale for transferring points to the national evaluation system

100-points scale	**National scale**
From 60 points to 100 points	Passed
Less then 60 points	Failed

Table 3 – The scale for evaluating the knowledge of students based on the results of the final control of the academic discipline

points	National scale		Mark in ECTS scale	
			Mark	Criteria
	exam	test		
90-100	**Excellent**	**Passed**	**A**	The theoretical content of the course has been mastered in its entirety, without gaps, the necessary practical 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	**Good**	**Passed**	**B**	The theoretical content of the course has been mastered in its entirety, without gaps, the necessary practical skills for working with the mastered material have mainly been formed, all educational tasks provided for by the training program have been completed, the quality of most of them has been assessed with a number of points close to the maximum
75-79			**C**	The theoretical content of the course has been mastered 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 number of points, some types of tasks have been completed with errors
67-74	**Satisfactory**		**D**	The theoretical content of the course is partially mastered, 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 completed, some of the completed tasks may contain errors

<table>
<tr><td rowspan="2">points</td><td colspan="2" rowspan="2">National scale</td><td colspan="2">Mark in ECTS scale</td></tr>
<tr><td>Mark</td><td>Criteria</td></tr>
<tr><td></td><td>exam</td><td>test</td><td></td><td></td></tr>
<tr><td>60–66</td><td></td><td></td><td>E</td><td>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.</td></tr>
<tr><td>35–59</td><td>Unsatisfactory</td><td rowspan="2">Failed</td><td>FX</td><td>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)</td></tr>
<tr><td>0–34</td><td>Unacceptable</td><td>F</td><td>The theoretical content of the course has not been mastered, the necessary practical work skills have not been formed, all completed educational tasks contain gross errors, additional independent work on the course material will not lead to any significant improvement in the quality of the performance of educational tasks (with a mandatory repeat course)</td></tr>
</table>

Course policy:

– the discipline course involves: teamwork, a friendly and creative environment in the classroom open to constructive criticism from the student and teacher;

– the discipline course involves working in a team, 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 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 valid reason, they present the completed tasks during independent work and consultation of the teacher;

– while studying a discipline 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 KhNADU"(https://www.khadi.kharkov.ua/fileadmin/P_Standart/pologeniya/stvnz_67_01_dobroch_1.pdf), "Academic integrity. Checking the text of academic, scientific and qualification 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 (https://www.khadi.kharkov.ua/fileadmin/P_Standart/pologeniya/stvnz_67_01_MEK_1.pdf).

- 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. Толмачов С.М. Будівельне матеріалознавство. Кам'яні матеріали, розчини та бетони на основі неорганічних в'яжучих / С.М. Толмачов, О.А. Бєліченко. – Харків, «НТМТ», 2018. – 240 с. ISBN 978-617-578-292-7.
2. Дворкін Л.Й. Будівельне матеріалознавство / Л.Й. Дворкін, С.Д. Лаповська. – Рівне: Вид-во НУВГП, 2016. – 448 с.
3. Кривенко П.В. Будівельне матеріалознавство / За редакцією П.В.Кривенка. – К.: ТОВ УВПК "ЕксОб", 2004. – 704 с.
4. Золотарьов В.О. Дорожні бітумні в'яжучі і асфальтобетони. Частина 1. Дорожні бітумні в'яжучі. Підручник. – Харків. ХНАДУ. 2015.
5. Золотарьов В.О. Дорожні бітумні в'яжучі і асфальтобетони. Частина 2. Дорожні асфальтобетони. Підручник. Харків. ХНАДУЦ. 2016.
6. Випробування дорожньо-будівельних матеріалів. Лабораторний практикум/ Золотарьов В.О., Братчун В.І., Космін О.В. та інш. За ред. Золотарьова В.О. Навчальний посібник. Харків. Видавництво ХНАДУ. 2006. -352 с.
7. Пыриг Я.И., Золотарев В.А. Методы оценки качества дорожных битумов: возникновение, развитие и современные возможности и использования. Учебное пособие. Харьков. 2013. 64 с.
8. Пиріг Я.І., Галкін А.В. Методи оцінки адгезії та когезії бітумних в'яжучих. Монографія за ред. В.О.Золотарьова. Харків. 2019. 223 с.

Additional resources:

distance course: *https://dl2022.khadi-kh.com/course/view.php?id=3639*
http://files.khadi.kharkov.ua
http://www.nbwv.gov.ua
http://korolenko.kharkov.com
http://library.univer.kharkov.ua

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