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

Basics of the scientific research

Subjects:	**Basics of the scientific research**
Level of higher education:	**first (bachelor's degree)**
Course page in Moodle:	https://dl.khadi.kharkov.ua/course/view.php?id=1236
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:	**Malyar Volodymyr, Ph.D., associate professor**
Contact phone number:	*+380677189941*
E-mail:	vladimirmalyar16@gmail.com

Brief content of the educational component:
The goal is to form a set of knowledge, skills and ideas about theoretical and experimental methods of scientific research and innovative activities in the field of construction and architecture.
Subject: theoretical and methodological foundations, methodological provisions of scientific directions of research in construction up to date.
The main tasks of studying the academic discipline are:
- training of specialists to independently solve production functions and typical tasks in the field of scientific research and their use in the practical activities of a scientist and highway builder;
- studying the methodology of scientific research in the field of construction;
- formation of skills in the organization of independent research work and presentation of the results of scientific research.

Prerequisites for studying the educational component: the study of the discipline «Basics of Scientific Research» is based on the knowledge base of the following disciplines: «Higher Mathematics» (chapters: mathematical analysis, mathematical statistics); «Informatics»; «Physics».

Competencies acquired by the acquirer:
***General competences*:**
Ability to abstract thinking, analysis and synthesis;
Ability to search, process and analyze information from various sources;
Special (professional) competences:
Ability to use conceptual scientific and practical knowledge of mathematics, chemistry and physics to solve complex practical problems in construction and civil engineering;
Ability to use computerized design systems and specialized application software to solve engineering problems in construction and civil engineering.

Learning outcomes according to the educational program:
Apply the main theories, methods and principles of mathematical, natural, social, humanitarian and economic sciences, modern models, methods and decision support software tools to solve complex construction and civil engineering problems;
Participate in research and development in the field of architecture and construction;

Collect, interpret, and apply data, including by searching, processing, and analyzing information from various sources.

Thematic plan

No Topicsr	Name of topics (LC, LW, PW, SC, IWS)	Number of hours	
		Full-time	external
1	LC. Introduction to the course.	2	2
	PW. Acquaintance with directions of scientific work of departments of the faculty.	2	-
	IWS. Study of theoretical materials and getting ready to practical classes.	7	-
2	LC. Basic principles of organization of scientific activity.	2	2
	PW. Acquaintance with the directions of the department's scientific work and topics RWS.	2	-
	IWS. Study of theoretical materials and getting ready to practical classes.	7	-
3	LC. Modeling in scientific activity.	2	-
	PW. Methods of random errors estimating.	2	2
	IWS. Study of theoretical materials and getting ready to practical classes	7	-
4	LC. Probabilistic and statistical research methods.	2	-
	PW. Univariate and multivariate variance analysis.	2	2
	IWS. Study of theoretical materials and getting ready to practical classes.	7	-
5	LC. Mathematical base of experiment planning.	2	-
	PW. Research planning of full and fractional factorial experiment.	2	-
	IWS. Study of theoretical materials and getting ready to practical classes.	7	-
6	LC. Factorial experiment and search for optimal conditions.	2	-
	PW. Research planning of a three-level factorial experiment. Construction of response surfaces.	2	-
	IWS. Study of theoretical materials and getting ready to practical classes.	7	-
7	LC. Experimental studies.	2	-
	PW. Processing of experimental results. Obtaining dependencies based on experimental data.	2	-
	IWS. Study of theoretical materials and getting ready to practical classes.	8	-
8	LC. Scientific ethics.	2	-
	PW. Determining the economic efficiency of implementing the results of scientific research into production.	2	-
	IWS. Study of theoretical materials and getting ready to practical classes.	8	-
Together		90	
	Lectures	16	
	Practical classes	16	
	Independent work	58	

Teaching methods:
1) verbal: 1.1 traditional: lectures, explanations, stories, etc.;
2) visual: method of illustrations, method of demonstrations
3) practical: 3.1 traditional: practical classes**;**

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 Evaluation of the current performance of higher education applicants is carried out at each practical session on a four-point scale («5», «4», «3», «2») and entered in the log of academic performance.

– «excellent»: the winner mastered the theoretical material flawlessly, demonstrates deep knowledge of the relevant topic or academic discipline, the main provisions;

- «good»: the applicant has mastered the theoretical material well, has the main aspects from primary sources and recommended literature, presents it in a reasoned way; 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, is almost not oriented 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:

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

where $K^{current}$– final assessment of success based on the results of current control;
$K1, K2, \ldots, Kn$ – 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).

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 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 calculation 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 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;

– 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 outcome is evaluated:

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

– on a 100-point scale 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

On a 100-point scale	**On a national scale**
from 60 points to 100 points	Enrolled
less than 60 points	not enrolled

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

Score in points	National scale	Mark in ECTS scale	
	test	Mark	Criteria
90-100	**Enrolled**	**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		**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		**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

Score in points	National scale	Mark in ECTS scale	
	test	Mark	Criteria
60–66		**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	**not enrolled**	**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		**F**	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).

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 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 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 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 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. Основы научных исследований: Учеб. Для вузов / В.И. Крутов, И.М. Грушко и др. –М.: Высшая школа, 1989. – 400 с.
2. Основи наукових досліджень: навч. посіб. / за заг. ред. Т. В. Гончарук. — Тернопіль, 2014. — 272 с.
3. Романчиков В.І. Основи наукових досліджень: навчальний посібник. – Київ: «Центр навчальної літератури», 2007. – 254 с.
4. Маляр В.В. Методичні вказівки для практичних занять з дисципліни «Основи наукових досліджень». –Харків: «Видавництво ХНАДУ», 2017. –16 с.
5. Кіреєва Є.Б. Методичні вказівки до самостійної наукової роботи студентів по кафедрі технології дорожньо-будівельних матеріалів спеціальності 7.092105, Харків, 2005. – 16 с.
6. Маляр В.В. Методичні вказівки до економічної частини дипломних проектів з технології виробництва дорожньо-будівельних матеріалів. – Харьків: «Видавництво Харківського національного автомобільно-дорожнього університету», 2012. – 24 с.
7. Маляр В.В. Програма та методичні вказівки до контрольних робіт з дисципліни «Основи наукових досліджень», Харків.: Видавництво ХНАДУ, 2018. – 12 с.

Additional sources:

1. distance course: https://dl.khadi.kharkov.ua/course/view.php?id=1236
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  Volodymyr MALYAR
signature Full name

Head of Department  Serhii OKSAK
signature Full name