Syllabus
educational component VK
(conditional marking OK in educational program (ONP))

Promising directions development materials science

Name disciplines:	**Promising directions development of materials science**
Level higher Education:	**the second (master's)**
Course page in Moodle :	**https://dl2022.khadi-kh.com/course/index.php?categoryid=788**
Amount educational component	**3 loans (90 hours)**
The form of the summary control	**Test**
Consultations:	**Not provided for educational plan**
Name departments:	**Chair technologies metals and materials science**
Teaching language :	**Ukrainian, english**
Head course:	**Hlushkova Diana Borysivna, Ph.D., professor**
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Short content educational component:

The goal is to acquaint students with new approaches and principles of developing materials with given properties, modern technologies of production and processing of materials, formation of a worldview based on knowledge of the role of science and technology in the development of society; education of cultural skills for the production of new materials, taking into account ecological and economic aspects.

Subject: the physical nature of the properties of new materials and their differences in different aggregate states from the point of view of the basic laws of phase and structural transformations that occur under specific physical and chemical conditions.

The main ones tasks study educational disciplines is:

- independently use modern ideas of materials science when analyzing the influence of macro-, micro- and nano-scale structure on the properties of materials, the interaction of materials with the environment, biological environment, in special operating conditions
- make a rational choice of materials, optimize their consumption based on the analysis of the given conditions of use of materials, assessment of their reliability, economy and environmental consequences of use.

Prerequisites for study educational component:

Discipline is being studied after
Study discipline "Foundations metallography and structural analysis materials", "Progressive structural materials", "Strength of construction and methods of increasing it", "Research work of students".

Competencies, whose acquires getter:

General competences:

The ability to generate new ideas and implement them in the form of sound innovative solutions.

Ability and readiness to implement modern technological processes of obtaining and processing materials and technologies for improving properties and restoring products in order to meet their production requirements.

Special (professional) competences:
Skill apply acquired knowledge about modern achievement in subject area.
The ability to apply modern methods and experimental techniques in laboratory and production conditions, the ability to use research and testing equipment to solve problems in the field of materials science.
The ability to perform scientific research, analyze and process the results of natural or model experiments, using regulatory documents, new hypotheses in the field of materials science, information technologies, software.

The results teaching in accordance to educational programs:
To know and understand the fundamental sciences underlying the relevant block of the "Materials Science" specialty at the level necessary to achieve the results of the educational program.
Know the principles of designing new materials, methods of physical and mathematical modeling in the creation of new and improvement of existing materials, technologies of their manufacture and processing, and use this knowledge in educational and teaching activities.
Know the main groups of materials and reasonably make their selection for specific operating conditions.
Use experimental methods of studying structural, physical-mechanical, electrophysical, magnetic, optical and technological properties of materials.

Thematic plan

Topic No	Name topics (LK, LR, PR, NW, SR)	Number of hours
		ocular
1	2	3
1	LK 1 Introduction. Materials science - science about creation materials with According to operational properties	2
	PR (LR, NW) Marking structural materials in accordance to European standards	2
	SR Development of information support for each module (topic)	6
2	LK Classification promising materials Scientific foundations development new ones materials	2
	PR (LR, NW) Methods research structure of materials. Optical, scanning and enlightening microscopy.	2
	SR Processing informative provision by by each module (topic)	6
3	LK Foundations nanotechnology and structural nanostructured materials	2
	PR (LR, NW) Research characteristics and properties alloys with by memory forms	2
	SR Processing informative provision by each module (topic)	6
4	LK New ones intellectual materials Concept creation intellectual materials	2
	PR (LR, NW.) Application aluminum alloys in air cosmic techniques	2
	SR Processing informative provision by each module (topic)	8
5	LK Ultra-light alloys	2

	PR (LR, NW) Ultra-light composite alloys Specifics composition and technologies production.	2
	SR Processing informative provision by each module (topic)	8
6	LK Amorphous materials.	2
	PR (LR, NW) Research properties amorphous alloys	2
	SR Processing informative provision by each module (topic)	8
7	LK Modified superficial layers and coating.	2
	PR (LR, NW) Progressive methods receiving protective coatings.	2
	SR Processing informative provision by each module (topic)?	8
8	LK Conclusions. Problems and ways their solution at design new ones promising materials	2
	PR (LR, NW) Environmentally friendly methods of obtaining functional coatings	2
	SR Preparation to final control	8
Together	LK	16
	PR (LR, SZ)	16
	SR	58

Individual educational and research task (by available): missing

Methods teaching:

1) verbal: 1.1 traditional: lectures, explanation, story etc;
1.2 unconventional :electronic version, remote
2) visual: method illustrations, method demonstrations
3) practical: 3.1 traditional practical occupation
3.2 unconventional stationary

System assessment 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 for 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 execution and design of practical work.

2 Evaluation of the current performance of students of higher education is carried out at each practical session on a four-point scale ("5", "4", "Z", "2") and entered in the journal of academic performance.

- "excellent": the applicant has fully mastered the theoretical material, provides comprehensive answers to the questions posed on the relevant topic, provides a correctly formatted report on the practical session, logically and well-groundedly explains the results obtained.

– "good": the applicant has mastered the theoretical material well, presents it in a reasoned manner; fully executed practical part work and maybe their justify skills but certain inaccuracies and errors are assumed in the presentation of the theoretical material or in the analysis of the obtained results of the practical task;

– "satisfactory": the student mainly knows the theoretical material on the educational topic, orients himself in the obtained practical results, but answers unconvincingly,

confuses concepts, answers additional questions uncertainly, confuses concepts because he does not have stable knowledge; does not confidently orientate himself in the obtained practical results and cannot justify them correctly;

– "unsatisfactory": the applicant has not mastered the educational material of the topic, does not know scientific concepts, is not oriented in theoretical issues and cannot explain the obtained practical results

3 The final score for the current activity is recognized as the average arithmetic sum of points for each practical session according to the formula:

$$K^{nomoч} = \frac{K1 + K2 + ... + Kn}{n},$$

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

$K1, K2, ..., Kn$ – evaluation of the success n of the current control measure;

n – number of ongoing control measures.

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

Table 1 – Recalculation of the average grade for the current activity into 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
						reassembly _	
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	

Conclusive assessment

1 Getter higher education receives test on to the last occupation with disciplines by

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).

Getters higher education, which have average current assessment with disciplines lower than

"3" (60 points), in the last lesson can increase their current score by answering additional tests on the discipline.

Assessment of knowledge acquirers by testing is carried out according to the scale:

– "Perfectly": not Less 90 % correct ones answers;
– "Very okay": from 82 % to 89 % correct ones answers;
– "Okay": from 74% to 81 % correct ones answers;
– "Satisfactorily": from 67 % to 73% correct ones answers;
– "Satisfactorily enough": from 60 % to 66 % correct ones answers;
– "Unsatisfactorily": Less 60 % correct ones answers

2 By condition receiving offset is:
– working out everyone missed occupations;
– average current rating with disciplines not lower "3" (60 points).
3 For the performance of individual independent work and for various types of scientific research tasks, depending on their volume and importance, the winners are awarded additional points of no more than 20. The final score together with additional points cannot exceed 100 points.
3.1 Additional points are added to the sum of points scored for the current educational activity, when the final form of control is a credit
4 The learning result is evaluated on a two- point scale (passed/failed) according to table 2;

Table 2 – Scale transfer points in national system assessment

By 100-point scale	By national scale
from 60 points to 100 points	counted
Less 60 points	not counted

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

Score in points	Evaluation on a national scale		Evaluation according to the ECTS scale	
	examination	test	Rating	Criteria
90-100	**Perfectly**	**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	**Okay**	**Enrolled**	**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

Score in points	Evaluation on a national scale		Evaluation according to the ECTS scale	
	examination	test	Rating	Criteria
67-74	**Satisfactorily**		**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
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 assessed with a number of points close to the minimum.
35–59	**Unsatisfactorily**	**Not 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**		**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)

Policy course:

– 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;

– everyone task, provided for program, have be performed in installed term;

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

– under time study course acquirers higher education should adhere to rules academic integrity, laid out in such documents: "Rules academic integrity of the

participants in the educational process of the Khnadu" (https://www.khadi.kharkov.ua/fileadmin/P_Standart/pologeniya/stvnz_67_01_dobroch_1.pdf) "Academic virtue. Audit text performed scientific and works on 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 Khnadu (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 lectures or practical works, using other people's educational materials (including the use of mobile devices) is prohibited Mobile devices are allowed to be used only during the online verification of the results of the practical task, additional testing.

Recommended literature:

1. Basic literature

1. Nano- and biocomposites / [edited by] Alan Kin-tak Lou, Farzana Hussain, and Khalid Lafdi: Taylor and Francis Group, LLC, 2010. - 406

2. Glassy, Amorphous and Nano-Crystalline Materials. Thermal physics, Analysis, Structure and Properties / Jaroslav Šesták, Jiří J. Mareš, Pavel Hubík. - Springer Dordrecht London Heidelberg New York, 2011. - 399

2. Supporting literature:

1. Abramovich H. Advanced Aerospace Materials: Aluminum-Based and Composite Structures. - De Gruyter, 2019. — 322 p.

2 Bunova G.Z., Yushin V.D., Voronin S.V. Aviation materials science. part I. Educational manual. — Samara: Samara State Aerospace University, 2012. — 91 p.

3. Metals for aircraft construction: characteristic, specifics, technology obtaining.

- Lutsk, LNTU, 2009 p. – 70 with.

Developer(s)
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