

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

Functional materials

Name disciplines:	Functional materials
Level higher Education:	the second (master's)
Course link in Moodle:	https://dl2022.khadi-kh.com/course/view.php?id=1976
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
Head course:	Ryzhkov Yuri Volodymyrovych, Ph.D., docent
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Short content educational component:

The goal is to form students a complex of basic knowledge and ideas about the formation of the structure and properties of modern materials and coatings, the mechanisms of manifestation of functional properties, manufacturing technology and the use of promising materials.

Subject: modern materials and coatings, their chemical, physical, and physico-mechanical properties, as well as processes and technologies that have found their application in creating functional materials and applying coatings.

The main ones tasks study educational disciplines is:

Demonstrate knowledge of the engineering sciences underlying the specialization at a level necessary to achieve other program outcomes, including sufficient awareness in their the last ones achievements Skill choose and apply suitable typical research methods (analytical, computational, modeling, experimental); correctly interpret the results of such studies and draw conclusions.

Prerequisites for study educational component:

Discipline is being studied after

Study of the disciplines "Physics", "Materials Science", "Increasing wear and corrosion resistance of parts", "Technology of coating".

Competencies, whose acquires getter:

General competences:

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

Ability to find process and analyze information from various sources. Ability and readiness to implementation modern technological processes receiving and processing materials and technologies for improving properties and restoring products in order to meet their production requirements.

Special (professional) competences:

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 technology, software.

Ability to perform a literature search of sources in the professional field and critically evaluate published materials.

Specialized knowledge of the latest methods and techniques of modeling, development and research of materials.

Knowledge of the main groups of materials and the ability to justify their selection for specific operating conditions.

The results teaching in accordance to educational programs:

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.

Apply knowledge and understanding of experimental design methods, perform experimental studies and process their results.

Thematic plan

Topic No	Name topics (LK, LR, PR, NW, SR)	Number of hours
		ocular
1	LK 1 Introduction. General characteristics of composite materials. Dispersion-strengthened and fibrous composite materials	2
	PR (LR, NW) Obtaining metal powders and study their properties.	2
	SR Processing informative provision by each module (topic)	6
2	LK Ceramic composite materials and KM on non-metallic basis	2
	PR (LR, NW) Obtaining metal powders and study their properties.	2
	SR Processing informative provision by each module (topic)	6
3	LK General patterns of amorphization and crystallization. Properties amorphous materials	2
	PR (LR, SZ) Obtaining electrical contact materials appointment and research their properties.	2
	SR Processing informative provision by each module (topic)	6
4	LK General characteristic electrical engineering materials Metal materials (conductors) with high conductivity Materials with tall pet resistance	2
	PR (LR, NW.) Obtaining powder magnetically soft materials and research their properties.	2
	SR Development of information support for each module (topic)	8
5	LK Semiconductors materials Dielectric materials Superconducting materials	2
	PR (LR, NW) Technology thermal oxidation	2
	SR Processing informative provision by each module (topic)	8
6	LK Alloys with special properties of thermal expansion. Materials from memory effect forms Super hard materials	2
	PR (LR, NW) Obtaining and study properties of structural sintered materials.	2
	SR Processing informative provision by each module (topic)	8
7	LK Nanomaterials. Methods obtaining nanostructured materials	2
	PR (LR, NW) Obtaining and study properties thin films	2
	SR Processing informative provision by each module (topic)?	8
8	LK The main ones methods research functional materials and coatings. Optical and transmission electron microscopy. Spectral methods research. X-ray methods nalysis	2

Together	PR (LR, NW) Obtaining and study properties thin films.	2
	SR Preparation to final control	8
	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 performance of a control or individual task, performance and design of practical work.

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

1.4 Seminar classes are evaluated by the quality of individual assignment/abstract.

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 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 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 recognized as the arithmetic mean sum of points for each lesson, for individual work, current test works according to the formula:

$$K^{nomou} = \frac{K1 + K2 + \dots + Kn}{n},$$

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

$K1, K2, \dots, Kn$ – 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 – Conversion of the average score for the current activity into a multi-point scale

4-point scale	100 points scale	4-ball scale	100 points scale	4-ball scale	100 points scale	4-ball scale	100 points 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	
						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	

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 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": 82% to 89% correct answers;
- "Good": from 74% to 81% of correct answers;
- "Satisfactory": from 67% to 73% of correct answers;
- "Fair enough": 60% to 66% 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 For performing individual independent work and participation in scientific events, additional points are awarded to the winners.

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 Khnadu 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 the required one*) :

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

On a 100-point scale	On a national scale
from 60 points to 100 points	counted
less than 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

Score in points	Evaluation on a national scale		Evaluation according to the ECTS scale	
	examination	test	Rating	Criteria
75-79	Satisfactorily		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
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)

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;
- the coursework must be protected no later than a week before the beginning of the examination session (**indicated if available**) ;
- while studying the course, students of higher education must comply with 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 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 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 during tests and exams is prohibited (including using mobile devices). Mobile devices are allowed to be used only during online testing.

Recommended literature:

1. Basic literature

1. Dmytrychenko M.V. Tribotechnics and foundations reliability cars: [learning manual]/ M.V. Dmytrychenko, R.G. Mnatsakanov, O.O. Mykosyanchyk - K.: INFORMATION AUTHOR, 2006. - 216 p.
2. Causing coating: [learning help] /by ed. Acad. NASU K.A. Yushchenko - 2nd edition - K.: Arista, 2006. - 204 p.
3. N. V. Podoprygora, M. I. Sadovy, O. M. Trifonova Solid state physics: educational manual. Kirovohrad: PP "Center operational polygraphy "Vanguard", 2014. 416 with.
4. G. IN. Pokhmurska, M. M. Student, IN. AND. Pokhmursky Gas-thermal coatings: a study guide. Lviv, 2017. 180 p.

2. Supporting literature

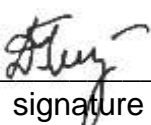
1. Shilina AT. P., Osadchuk AND. Yu. Gas thermal methods dusting of coatings. Tutorial. Vinnytsia: VNTU, 2006. 103 p.
2. Oak OHM., Stepanchuk A.M. Technology spraying coatings Textbook. Mykolaiv: National university shipbuilding, 2007. 236 p.

Developer(s)
syllabus of the educational
discipline


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