

**Syllabus**  
**educational component**

**Measurement mechanical characteristics materials**

Name disciplines :	<b>Measurement mechanical characteristics materials</b>
Level higher than her and you too :	<b>the first (bachelor's)</b>
Page course in Moodle :	<b><a href="https://dl2022.khadi-kh.com/course/index.php?categoryid=840">https://dl2022.khadi-kh.com/course/index.php?categoryid=840</a></b>
Amount educational component	<b>3 loans (90 hours)</b>
Form final control	<b>Test</b>
Advice :	<b>by schedule</b>
Name departments:	<b>chair technologies metals and materials science</b>
Language teaching:	<b>English</b>
Ke r and vny k course :	<b>Yuryi Volodymyrovych Ryzhkov , Doctor of Technical Sciences , Assoc</b>
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**Short content educational component:**

The purpose is to learn theory mechanical properties metals and alloys in tight interconnection between structure and properties metals

**Subject:** theory and mental experiments methodic admit it mechanical properties materials.

**The main ones tasks study educational disciplines is:**

A bachelor must be able to analyze the working conditions of specific parts and products; to be able to determine the details of the characteristics of the mechanical properties and structure of the metal that are most important for the given working conditions, to conduct a comparative assessment of alloys according to their operational and technological properties; have experience in conducting mechanical tests in accordance with current standards.

**Prerequisites for study educational component:**

Construction materials technology and materials science.

Strength of Materials.

Physics

**Competencies, whose acquires getter:**

**General competences :**

Ability to speak and write in native language.

Ability to act on the basis of legal and ethical judgments.

Ability to make informed decisions in production conditions.

Willingness to use humanitarian, mathematical, natural-scientific and general engineering knowledge in professional activities.

**Special (professional) competences:**

Willingness to use technical means of measurement and control necessary for standardization and certification of materials.

**The results teaching according to educational programs:**

As a result of mastering a real discipline, students should:

Know the classification, marking, regimes of strengthening heat treatment, mechanical properties and fields of use of steels - the main material of industry.

Apply experimental methods of studying structural, physical-mechanical, electrophysical, magnetic, optical and technological properties of materials.

### Thematic plan

Topic No	Name of topics (LK, LR, PR, SZ, SR)	Number of hours
		ocular
1	LK The role of metals in modern technology. Basic concepts of strain and stress.	2
	LR Dynamic mechanical tests of metals.	2
	SR Stressed state of metals.	8
2	LC Elastic and plastic deformation of metals.	2
	LR Analysis of the primary deformation diagram during the static tensile test of metal. Construction of the deformation diagram in real coordinates. Determination of specific work of uniform deformation.	4
	SR Phenomena of elastic imperfections in metals	8
3	LC Static tests for tension, compression, bending and torsion.	2
	LR Conducting static tests for tension, compression, and bending	2
	SR Impact bending test.	8
4	LK Static, dynamic methods of determination of hardness.	2
	LR Static and dynamic methods of hardness determination: according to Brinell, according to Rockwell, according to Vickers	2
	SR Destructive methods of determination of hardness	10
5	LK Assessment of metal susceptibility to brittle fracture and cold brittleness based on test results.	2
	PR (LR, SZ) -	-
	SR Ways of increasing the cold brittleness of metals and alloys.	5
6	LK Testing of metals for delayed destruction. Short-term tests at elevated temperatures. Testing of metals for creep. Durability test.	2
	LR Impact toughness test. Serial shock tests, determination of the temperature of the viscous-brittle transition of metals	2
	SR Methods of increasing the heat resistance of metals and alloys.	6
7	LK Fatigue strength of metals. The effect of surface cleanliness, the nature of load changes, the environment and other factors on the durability of metal. Fatigue curve.	2
	LR Application of the Larsen-Miller method to determine the limit of long-term strength of boiler heat-resistant steels. Determination of the established creep rate of heat-resistant steels.	2
	SR Relationship of endurance limit with other mechanical properties.	6
8	LC Causes of thermal cracks in metals. Heat resistance test.	2
	PR (LR, SZ)	-
	SR Methods of increasing the thermal stability of metals.	5
<b>Together</b>	LK	<b>16</b>
	PR (LR, SZ)	<b>16</b>
	SR	<b>58</b>

**Individual educational and research task** (if available): absent

**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

**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
<b>90-100</b>	<b>Perfectly</b>	<b>Enrolled</b>	<b>A</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 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
<b>80-89</b>			<b>B</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
<b>75-79</b>	<b>Okay</b>	<b>Enrolled</b>	<b>C</b>	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
<b>67-74</b>	<b>Satisfactorily</b>		<b>D</b>	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
<b>60-66</b>			<b>E</b>	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.
<b>35-59</b>	<b>Unsatisfactorily</b>	<b>Not counted</b>	<b>FX</b>	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)
<b>0-34</b>	<b>Unacceptable</b>		<b>F</b>	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 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.p](https://www.khadi.kharkov.ua/fileadmin/P_Standart/pologeniya/stvnz_67_01_dobroch_1.p))

[df](#)), "Academic integrity. Checking the text of completed academic papers and works for plagiarism"

([https://www.khadi.kharkov.ua/fileadmin/P\\_Standart/pologeniya/stvnz\\_85\\_1\\_01.pdf](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 National Academy of Sciences of Ukraine ([https://www.khadi.kharkov.ua/fileadmin/P\\_Standart/pologeniya/stvnz\\_67\\_01\\_MEK\\_1.pdf](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 using mobile devices) is prohibited. Mobile devices are allowed to be used only during online checking of practical task results, additional testing.

### **Recommended Books:**

1. Tsurpal I.A. Mekhanika materialiv i konstruktсии /I.A.Tsurpal - K.: Vyshcha osvita, 2017. -367 s.

2. Kholiavko V.V. Fizychni osnovy mitsnosti ta ruinuvannia [Tekst]: Konspekt lektsii z dystsypliny dlia studentiv napriamu pidhotovky 6.050403 „Inzhenerne materialoznavstvo” spetsialnosti 8(7).05040303 – «Kompozytsiini ta poroshkovi materialy, pokryttia» dennoi ta zaochnoi form navchannia / Uklad.: V.V. Kholiavko. – K.: NTUU „KPI”, 2016. - 100 s.

3. Mekhanichni vyprovuvannia konstruktсийnykh materialiv za vysokoshvydkisnoho roztiahu u shyrokomu diapazoni temperatur [Tekst] : navch. posib. dlia stud. vyshchykh tekhn. navch. zakladiv / O. P. Vashchenko ; Natsionalnyi transportnyi un-t. - K. : NTU, 2000. - 93 s.

4. Shydlovskiy M.S., Babenko A.Ye., Boronko O.O., Zakhovaiko O.P., Trubachev S.I. Novi materialy: chastyna 2 - Eksperymentalni metody doslidzhen mekhanichnykh vlastyvostei konstruktсийnykh polimeriv ta plastmas. [Tekst]: Navchalnyi posibnyk dlia studentiv spetsialnosti «Prykladna mekhanika» spetsializatsii «Dynamika i mitsnist mashyn» – K.: KPI im. Ihoria Sikorskoho, 2017. – 265 s.


5. Afanasieva O.V. Materialoznavstvo ta konstruktсийni materialy. Navch. posibnyk. – Kharkiv: KhNURE, 2016. – 188 s.

Developer(s)  
syllabus of the educational  
discipline

  
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